Three Essays on Welfare and Development Economics:

A Place Based Approach

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ABSTRACT

The thesis contains three essays on development and welfare economics. The first essay investigates the relationship between economic growth, income inequality and absolute poverty (those living on less than $1 per day) using data from 56 developing countries in Africa, Asia and Latin America. In doing so, I first address the two-way causality relationship between growth and inequality. Consistent with previous studies on income inequality and growth in developing countries, I find that higher initial income inequality retards growth. In addition, I find that quality institutions have higher explanatory power than geography and climate. Using Geographic Weighted Regressions scheme this essay also finds evidence that growth is the central driving factor in reducing poverty and income inequality has a positive association with poverty. Besides, both the partial elasticity of poverty to growth and inequality exhibit significant systematic geographic variation across countries.

The second essay examines the regional variation in local poverty for nearly 2,400 rural and urban Canadian communities using 1981-2001 Census data. In doing so, three different measures of poverty are used to examine the response of local poverty to changes in local economic and demographic attributes. These measures of poverty include: average economic family's poverty gap, local poverty rate (LICO rates) and per capita poverty gap levels. By employing fixed effect panel data estimation technique, I find that local economic/ labor market conditions have greater impacts in explaining the regional variation in poverty gap and incidence levels across communities. However, the response of the family poverty gap to changes in labor market conditions is higher compared to poverty incidence or per capita gap levels. On the other hand, individual poverty gaps are shaped mostly by community demographic structure. Therefore, I find that using different types of poverty measurements results in drawing slightly different conclusions on the relationship between local attributes and the poverty-level outcome.

Finally, the third essay analyzes the nature, magnitude and direction of labor market responses and wages across Canadian communities in relation to job creation and accessibility. In particular, this study explores whether better employment access (geographic proximity) will improve labor market outcomes for low-wage earning rural and urban Canadians by giving special attention to communities with greater concentration of recent immigrants and Aboriginal Canadians. First, it finds that better job-access is inversely related to the proportion of workers who are low wage earners (those with hourly wage less than $10 per hour). This relationship is stronger in rural communities; however, in urban areas prevalence of low-wage earners has no association with job access. Human capital plays a prominent role in urban areas. Nonetheless, it finds evidence that urban communities with higher shares of recent immigrants have positive association with low wage share even after controlling for human capital and other factors.

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TABLE OF CONTENTS

Essay 2: Poverty Incidence and Intensity: Variation across Canadian Communities

Essay 3: Regional Analysis of Job Access and Wages in Rural and Urban Canada

LIST OF TABLES

LIST OF FIGURES

Essay 1: Geographic Analysis of Poverty –Growth and Inequality across Developing Countries

1.0 Introduction

Poverty reduction and acceleration of economic growth have been primary targets of policy makers in many developing countries. The efforts to meet the time-bound and quantified targets for addressing extreme poverty in its many dimensions- income poverty, hunger, disease, lack of adequate shelter, and education - by 2015 known as the *Millennium Development Goal* is a good example (United Nations, 2006).

In the past two decades there has been a significant economic growth in many poor countries. This has been manifested by the decline in the number of extreme poor - those living on less than $1 per day- [1] by 200 million (Dollar and Kraay, 2003; Bourguignon and Morrisson, 2001; Chen and Ravallion, 2001). However, the success of poverty reduction has not been uniform across all developing countries. For instance, compared to Sub-Saharan Africa, the bulk of poverty reduction has occurred mainly in East and South Asia (Dollar and Kraay, 2003; Easterly and Levine, 1998).

This phenomenon has triggered a long debate on the mechanisms that may lead to the decline in the number of poor, resulting in many explanations. Following Collier and Gunning (1999), the explanations can be usefully grouped into two by two matrices on policy and exogenous "destiny" on one side and between domestic and external factors on the other. To a large extent, these categories encompass: the quality of economic and political institutions, trade policies, level of income disparity, geography and difference in natural resource endowments, level of foreign aid and ethno-demographic composition.

Economic growth is considered the first necessary condition for poverty reduction.[2] Hence, understanding the cross-country growth determinants plays a key role. However, most of the previous literature on economic growth tends to focus on the cross-country own socio-economic and policy variables avoiding the importance of location in shaping the level of growth (Abreu et al., 2005). Thus the standard growth regression studies have been criticized for being non-robust in not including the influence of location,

[1] The percentage of population who earn less than a dollar a day is hereafter referred as the poverty rate. This cut-off poverty line is a standard measure used by the World Bank and most poverty studies for developing countries.

[2] The degree and extent to which growth is favorable to those who are at the lower tail of the income distribution is very important as the strength of the trickle-down effect varies in different countries with different socio-economics and institutions. For example, Ravallion (1997) using household level survey data in developing countries concluded that for any positive rate of growth, the higher the initial inequality, the lower the rate at which income-poverty falls. It is possible for inequality to be sufficiently high to result in rising poverty, despite good underlying growth prospects. On the same token, Bourguignon (2002) asserts that despite significant economic growth in some countries the rate of poverty reduction was higher in countries with relatively slower economic growth.

especially the proximity to other poor countries. In addition, the issue of distribution is also critical in shaping both growth and poverty rates. Simon Kuznets' (1955) hypothesis on the relationship between income and development states that economic growth initially widens inequality but narrows it at a later stage. However, other cross-country empirical studies indicate that higher inequality tends to retard growth in poor countries and encourage growth in rich countries (Barro, 2000). On the other hand, Feldstein (1998) argues that income inequality is a problem in need of no remedy. Nonetheless, recently the issue of growth determinants has shifted gears towards economic institutions as key factors in explaining the different growth levels across countries (Acemoglu et al., 2004; Hall and Jones, 1999; Glasser and et al., 2004). Specifically, the use of new sets of historical instruments as measures of current institutions has been gaining popularity in many of the cross-country growth regression studies.

Moving beyond the determinants of average income, some studies have also tried to econometrically analyze the interdependence between poverty, growth and inequality (e.g. Kraay, 2006; Ali and Elbadewi, 1999; Dollar and Kraay, 2002; Mehanna, 2004; Levine et al., 2005; Dollar, 2004; Chen and Ravallion, 2003; and Bourguignon, 2002). However, these studies were limited to absolute location- the effect of being located at a certain climate or latitude. The empirical analysis on the structural interdependence of poverty, growth and inequality are setup without spatial independence and spatial structure. The extra "penalty" of poverty for a country situated in a poor region was somehow overlooked. The geographic dimensions considered in the past poverty literature were mainly latitude, climate and topology as key determinants for growth (Abreu et al., 2005).[3]

In this paper I set up a spatial simultaneous equation model of these *endogenous* variables to systematically analyze the shares of location and time in explaining the persistence of 'harsh' poverty levels in 56 developing countries of Asia, Africa and Latin America over the period from 1965 to1990. The main contribution of the paper is reflected in the empirical framework that allows all the variables to be endogenously determined. Moreover, to fully understand the degree and extent of the cross-country heterogeneity in poverty elasticity to growth and inequality, a Geographically Weighted Regression (GWR) scheme is employed in computing the partial poverty elasticity **(**Fotheringham et al., 2002) in addition to the standard ordinary least square (OLS) estimation.

I proceed in two stages. First I estimate the cross country determinants of growth and income inequality drawing on the insights gained in the cross-country growth and inequality regressions. Second, I expand

[3] Abreu et al. (2005) classify the empirical literature on growth as "Absolute" and "Relative" location studies. The absolute location studies which employ non-spatial econometric technique mainly focus on the spatial heterogeneity (e.g. Bloom and Sachs, 1998; Diamond, 1997; Hall and Jones, 1999; Acemeglu et al., 2001; Rodrik et al., 2002) . On the other hand, the relative location studies control for technological diffusion, spillover or use the standard econometric technique (Anselin, 1988). Examples of relative location studies include (e.g. Easterly and Levine, 1998).

this to the issue of poverty determinants with particular attention on growth and income inequality (*gini*)[4] in a spatial fashion (GWR).

A first finding is that income inequality retards growth in developing countries. This is consistent with the *imperfect market* and *social unrest* theories documented in the past growth-inequality literature for developing countries. This suggests the need for an optimal resource reallocation to facilitate the full participation of the poor in the growth generating activities which in turn may pay some dividends. I also find that quality institutions do spur growth. Higher levels of civil and economic rights are crucial in shaping cross country growth differentials. Thus, security (stability) and well defined property rights should be at the forefront of policy issues in developing countries. Life expectancy, which is a reflection of health services, is critical in enhancing a country's level of economic growth.

Another finding is that economic growth does not have any explanatory power in the inequality regression. This confirms the notion that income disparity does not change quickly over time. However, the socio-demographic structure (the degree of societal heterogeneity) has good explanatory power in explaining income inequality. Ethnic fraction is inversely related to inequality while linguistic fraction is positively liked to earning disparity. This indicates that ethnic fraction *per se* may not be a problem as long as the majority can speak the most widely spoken language in the country. I believe this is highly correlated with the high transaction cost that might emanate from the fact that some sections may not be able to engage in profitable ventures due to language barriers. This validates ethnic and linguistic fractions as good instrumental variables for income inequality.

Thirdly, both the global and GWR estimation results verify that economic growth reduces poverty and it exhibits a significant geographic variation in its magnitude across countries. Conversely, income inequality has a positive association with poverty and exhibits a systematic geographic variation across countries. Finally, the comparison of global and local estimation results sheds an important light and understanding on the differential effects of the determinants of poverty across developing countries. A detailed discussion of each variable is presented in the rest of the paper.

This paper is organized as follows. The next section (section 2) presents the contextual link between poverty rate and its determinants. Section 3 discusses the theoretical model, the econometric estimation and description of the dependent and explanatory variables. Section 4 briefly describes the data and data sources along with statistical description of the variables. Section 5 provides the regression results and finally section 6 concludes with summary and policy implications.

[4] The most commonly used measure of income disparity is the Gini Coefficient. The value of Gini ranges from 0 to 1, with higher values associated with more income inequality.

1.1 Context

Development is not purely an economic phenomenon. The prevalence of countries in the world mired in poverty despite achieving significant economic growth is an indication. For this reason, development should be perceived as a multidimensional process involving the reorganization and reorientation of the entire economic and social system (Todaro and Smith, 2003). It goes beyond the improvements in income and output. In what follows, I try to explain the conceptual link of poverty with level of economic growth, income inequality, type of institutions, geography and level of external aid.

1.1.1 Poverty and Economic growth.

While macroeconomic policies that foster economic growth can potentially increase the income of the poor, the degree to which poor people benefit from economic growth is still contentious. For instance, Dollar (2004) documents that accelerated growth rates in developing countries in the past two decades have coincided with the decline in the number of the poor in the world for the first time in history. In this regard, for growth to be considered "pro-poor," there should be a significant increase in average income coupled with a high sensitivity of poverty to growth in average income (Kraay, 2005).

Ravallion and Chen (1997) found that on average in a sample of developing countries, the growth elasticity of poverty, measured by a dollar a day, was estimated to be around 3. However, the effect of increase in average income may fail to reach the poor because of high income inequality. Hence, Bourguignon (2002) notes that there is cross-country heterogeneity behind the average figure and understanding the causes of that heterogeneity is crucial in designing effective poverty alleviating strategies. As a result, the effect of income distribution is of a paramount importance as growth manifested in terms of an increase in the average income level does not necessarily influence those in the lower tail of the income distribution.

Although growth per se is not the panacea for global poverty, it is still the main central driving force for reducing poverty. Thus standard growth-enhancing policies should be at the center of any poverty reduction strategy (Dollar and Kraay, 2002).

1.1.2 Poverty and Income Inequality

A casual look at the relationship between income inequality and poverty may indicate that these two measures of income disparity do overlap. Ravallion (2000) notes that poverty measures absolute levels of living –how many people cannot attain certain pre-determined consumption needs whereas inequality reflects the disparities in levels of living- income gap between rich and poor. Poverty can also be measured in relative or absolute terms. If poverty is measured in absolute terms- e.g. a dollar a day

poverty line, there is a clear distinction between poverty and inequality. In this case, the degree of income inequality is not necessarily a direct reflection of the level of absolute poverty. On the other hand, if poverty line is proportional to mean income, the resulting measure behaves more like a measure of inequality (Ravallion 2000). Therefore, international absolute poverty measured by a-dollar-a-day exhibits less overlap with income inequality. For example, in Latin American countries where income inequality is historically very high compared to other developing countries – the level of absolute poverty is very low. Conversely, national (country specific) poverty rates set by income cut-offs formulated by national governments is expected to exhibit more over-lap with income inequality (*gini*).

The channels through which inequality (*gini*) interacts with poverty can be divided into two dimensions. First is its effect on the level of growth; the second channel is the post growth distribution pattern. However, the issue of income inequality and growth is still contentious. Partridge (2005), suggests that studies find differing effects when considering rich and poor countries, regions versus nations, cross-sectional versus time series evidence. For example, Barro (2000) asserts that higher inequality tends to retard growth in poor counties and encourage growth in rich countries. Thus, higher inequality might put a brake on poverty reduction effort through taxing economic growth in developing countries.

Other theories stress on social and political disruptions as causal factors in inhibiting growth in poor countries. With regards to poverty, Chen and Ravallion (2001) suggest that rising inequality between or within countries does not put a brake on overall progress in reducing the absolute number of poor. On the contrary, greater need for redistribution in economies where the majority has meager access to productive resources tends to negatively affect growth and the speed of poverty reduction (Alesina and Rodrik, 1994). Nonetheless, it is worth noting here that, the level of income inequality itself is also endogenous to growth, and is determined by the nature of policies, institutions and ethno-demographic composition of the country.

1.1.3 Poverty and Geography

A mere glance at the world distribution of poverty gives the picture that the majority of the world's poor are concentrated in some specific corners of the world, in parts of Africa, Asia and Latin America. In this regard, Gallup et al. (1998) discuss that location and climate have large effects on income levels and income growth through their influence on transportation costs, disease burdens and agricultural productivity among other channels. They further suggest that geography could also be decisive in the choice of economic policies. Moreover, spatial clustering of poor countries puts extra "penalty" for countries in that region due to a negative spill-over effect in the absence of globalization. This is

manifested in terms of the relative absence of globalization as indicated by the absence of positive technological and productivity transfers and trade.

Conversely, Acemeglu et al. (2002) report findings that are inconsistent with the direct link between development and geography. They give institutions or organization of society a major role in explaining the differences in economic performance of countries. This questions the validity of the geography hypothesis of Sachs and Bloom (1998) and Diamond (1997) that time invariant geographic features such as climate and disease influence work effort and productivity. This puts more weight on qualities of economic institutions and policies as core factors. However, institutions versus geography argument are still debated.[5]

1.1.4 Poverty and Institutions

Institutions and political history that influence incentives in human exchange, whether political, social or economic, have been gaining more attention in explaining the rate of economic growth (North, 1987; Hall and Jones, 1999; Rodrik, 2000; Acemoglu et al., 2004, 2001; Glaeser et al., 2004; Dollar and Kraay, 2003). Institutions here are defined according to North (1981) as "a set of rules, compliance procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals in the interest of maximizing the wealth or utility of principals." The main focus is on economic institutions that shape the nature of property rights, regulatory institutions, and institutions of macroeconomic stability, institutions of social welfare and the institutions for conflict management.

The above mentioned institutions are of paramount importance for economic growth because they shape the incentives facing key economic actors in society. In particular, they influence investment in physical and human capital and technology (Acemoglu et al., 2004). In addition, economic institutions also determine the ultimate distribution of resources among different groups in society. In other words, these institutions not only shape the growth potential of the economy, but also the ultimate distribution of that growth.

1.1.5 Poverty and Aid

According to the Harrod (1939) - Domar (1946) model of economic growth, the main bottleneck for achieving significant economic growth in many developing countries is relatively low level of capital formation. This justifies the need for the transfer of capital and technical assistance from rich developed

[5] Sachs and McArthur (2001) found that both weak institutions and geography related variables such as incidence of malaria or life expectancy at birth are strongly correlated with income per capita of countries opposing the suggestions by Acemeglu et al. (2000) that weak institutions but not physical geography explain the variation in income across former colonies. Rodrik et al. (2004) also note that institutions have higher direct effect on income whereas if quality of institutions is accounted for geography has weak direct but high indirect effect on income through institutions.

nations to poor counties. In fact, at the 2000 Millennium Summit, bilateral and multilateral donors have committed to making a substantial increase in the volume of development assistance they give to many poor developing countries.

Foreign aid and assistance have played a major role in many countries such as Republic of Korea in 1960's, Indonesia in 1970's, Bolivia and Ghana in late 1980's and Vietnam in 1990's (World Bank, 1998). Aid has helped recipient countries to transform from crisis to development through the help in designing good development policies, training of public and private sectors to enhance their capacity and of course finance to finance and reform public services. However, these success stories of foreign aid are not present in all recipient countries. In this regard, Burnside and Dollar (2004) note that aid accelerates growth only in developing countries with sound institutions and policies. That is, massive military expenditure, corruption and other rent seeking behaviors of officials and politicians can lead to ineffectiveness of aid.

1.2 Theoretical Background

In this section I develop a modified poverty-growth-distribution simultaneous equation model based on the model developed by Ali and Elbadawi (1999). Their model was built focusing on the role of inequality in the joint determination of growth and poverty without any spatial interaction or structure. They formulate income inequality as an additive function of mean income following the Kuznets income growth relationship. I modify their structural model by explicitly accounting for both spatial heterogeneity and spatial dependence (spillover effects). In doing so, I first formulate the growth equation followed by distribution and finally the poverty equation that includes both growth and distribution effects.[6]

1.2.1 Growth Component

The growth component equation in (1) below specifies growth in country i (g_i) as being determined by the degree of income inequality (country gini coefficient θ_i) and a vector of growth fundamentals (e.g. human capital, demographics, institutions, initial income, external aid etc.) The distance weighted average lagged regional growth rate that captures the negative or positive spillover effects is represented by Wg_i. Socio-economic and demographic characteristic of the neighboring countries are included as WX_i. This will account for the features of neighboring countries that will spur or encumber the growth of country i.

[6] Spatial heterogeneity occurs when estimated parameters vary across countries depending on their absolute location. For example, the effect of trade distortion on growth may be higher in countries with sea outlets compared to land locked countries. On the other hand, spatial dependence occurs when there are positive or negative spillover effects from neighboring countries. E.g. the growth rate of a country surrounded by politically unstable countries may not accelerate due to negative spillover effects it might face in the form of refugees or even leading to regional instability as it might start to develop into regional chaos as more neighboring countries start to get involved. The case of Rwanda, Burundi, Democratic Republic of Congo, Somalia and the former Balkan States are good examples (Abreu et al., 2005).

These neighborhood effects may be manifested in the form of human capital spillovers and technology diffusion (Durlauf and Quah, 1999). The opportunity to learn or mimic from neighbors with good economic policies is another channel (Easterly and Levine, 1998). Regional political stability may also affect economic growth of countries in the region. For example, Murdoch and Sandler (2004) assert that civil wars within a distance of 800 km can have a negative effect on the growth level of a country.

$$g_i = g(\theta_i, X_i, WX_i, Wg_i, \mu_i) \quad (1)$$

1.2.2 Inequality Component

Equation (2) below specifies the level of income inequality in a country as a function of mean income and other non-distribution variables X_i (such as human capital, aid, urbanization rate etc.).[7]

$$\theta_i = \theta(\mu_i, X_i) \quad (2)$$

Where, μ_i is the level of mean income of the country. Based on the Kuznets inequality–development relationship, the rate of change of income inequality is given by:-

$$\hat{\theta}_i = \nu \hat{\mu}_i + \nu_0 \quad (3)$$

where $\hat{\mu} = \frac{d\mu}{\mu}$ and $\hat{\theta} = \frac{d\theta}{\theta}$

In the above equation $\hat{\theta}$ denotes the rate of change of gini coefficient expressed as a function of mean income growth rate. The rate of change of inequality (*gini*) to mean income growth is denoted by *v*.

1.2.3 Poverty Component

The poverty specification (equation (4)), depicts poverty index, *P*, as a function of income inequality (θ_i) and mean income μ_i. [8]

$$P_i = P_i(\theta_i, g_i, \mu_i) \quad (4)$$

[7]Mankiw, Romer and Weil (1992) use a Solow growth model to show the relationship between economic growth and population growth and human and physical capital (Dualaf, 2000). However, population growth may be endogenous to economic growth. As a result, equation (1) follows recent growth models which focus on other covariates that directly affect growth and are correlated with population or investment growth.

[8]Poverty is not a direct function of growth; it is a function of income (levels) and distribution. On the other hand, income is a function of previous period income (convergence) and growth. Change in the poverty rate is directly related to growth and the change in distribution. In this study a log linear poverty function is assumed in order to address the effect of variables that are persistent over time. Fixed effects such as geographic, institutional and other variables that are persistent over time cannot be addressed because they will be differenced out if the change in poverty rate is considered.

Ali and Elbadawi (1999) note that the poverty index *P* exhibits homogeneity of degree zero in poverty line (a dollar a day cut-off) and mean income. Its partials are increasing with respect to inequality and decreasing with respect to mean income. In other words, widening income disparity within a country is expected to lead to a higher poverty rate.

In order to decompose the change in poverty rate into a growth component and distribution component, a log linear poverty function is assumed (equation (5)).

$$\ln(P_i) = \ln(P_i(\theta_i, X_i, wX, wg_i, \mu_i)) \tag{5}$$

From Equation (1) and given $d\mu/\mu=g$

$$g_i = (I - \rho W)^{-1} g(\theta_i, [I + \rho W] X_i)$$

Thus totally differentiating the log-linear poverty equation (5) renders:-

$$\frac{dP_i}{P_i} = \gamma(\mu_i, \theta_i)\frac{d\theta_i}{\theta_i} + \eta\left[(I - \rho W)^{-1}[(\mu_i, \theta_i)\frac{d\mu_i}{\mu_i} + (\mu_i, \theta, X)(I + \rho W)]\right]\frac{d\mu_i}{\mu_i} \tag{6}$$

Where η is the elasticity of poverty to growth in mean income, and γ is the elasticity of poverty to changes in the level of income inequality. The spatial multiplier which accounts for the spill-over growth effects of neighbors is given by $(I- \rho W)^{-1}$. The induced neighborhood effect as a result of neighborhood socio-demographic and economic characteristics is represented by $(\mu_i,\theta,X)(I+W\rho)$. The induced part captures the effects of trade possibilities and skill sharing among others things. Thus, η is the total elasticity of poverty to growth. It is composed of both the inequality (θ_i) and surrounding regions (*WX*) as well as the country's own characteristic (*X*) combined effects on growth.

1.3. Methodology and Estimation

Based on the framework presented above, I empirically examine the simultaneous link between equations (1), (2) and (6) over the period from 1965 to 1990. The econometric model to be estimated is given as follows:-

$$g_{i,1985-1990} = \alpha_2 + \kappa Income_{i,initial} + \phi_2 \cdot \theta^{**}_{i,1985-1990} + X_{i,1965-1985}\beta + \alpha_2 \cdot insti_{i,1965-1985} + \lambda_2 \cdot Geog_i + \xi Cont_i + \varepsilon_{1i,t} \tag{7}$$

$$\theta_{i,1985-1990} = \alpha_3 + \psi\theta_{initial} + \lambda_3 \cdot g^{**}_{i,1985-1990} + X^G_{i,1965-1985}\beta + \varepsilon_{2i,t} \tag{8}$$

$$P_{i,1985-1990} = \alpha_1 + \phi_1 \cdot \theta^*_{i,1990-1985} + \lambda_1 \cdot g^*_{i,1990-1985} + X^P_{i,1965-1985}\beta + \lambda_1 \cdot Geog_i + \varepsilon_{i,t} \tag{9}$$

Equations (7) and (8) denote the growth and inequality determination respectively. The dependent variable in Equation (7) is the average growth level over the period from 1985 to1990 regressed on the initial income level, demographic, economic and geographic variables (*X*), which are averages for the period from 1965to1985. However, the level of income inequality (θ**) is an average for the same time span as the dependent variable.

Equation (8) depicts the inequality equation which functionally relates the average value of income inequality over the period 1985-1990 to its initial value and other socio demographic variables and growth (1985to1990 average). Finally, Equation (9) represents the poverty equation where the dependent variable is the percentage of population with income less than a dollar a day. For clarity, I first discuss the estimation process and explanatory variables in equations (7) and (8) followed by the discussion for Equation (9).

Equations (7) and (8) are estimated using Two Stage Least Square estimation. The main purpose here is to address and mitigate the issue of endogeneity between growth and inequality. That is, to acquire unbiased growth and inequality coefficients in computing poverty elasticity in relation to these variables. This is due to the fact that both inequality and growth are endogenous outcomes of the socio-economic structure.

Therefore, to tackle this two way causality between growth and inequality, I estimate an instrumental variable regression for growth and inequality. In estimating the growth equation, I hypothesize that the difference in **Ethno-Linguistic Diversity** is a potential "*source*" of the substantial difference in both public policy and income inequality across countries.

The rationale here is to establish a link between growth and ethnic and linguistic diversity via their effect on income inequality. In doing so, I use two measures of ethnicity and linguistic heterogeneity in developing countries. Ethnic fraction (diversity) is measured by the probability that two randomly selected individuals in a country will belong to two different ethnic groups. Whilst, the linguistic heterogeneity (diversity) in a country is measured by the percentage of population not speaking the most commonly used language in the country. These two Ethno-linguistic diversity measures are acquired from Easterly and Levine (1997).

The underlying argument here is that societal polarization reflected in the degree of ethnic and linguistic diversity shape the nature and degree of productive resource ownership among different sects in a society. A wide-ranging ethnic fractionalization, for example, might make consensus on public policy difficult or the favor might always tilt towards groups who are economically and politically dominant. Similarly, greater linguistic barriers might put certain groups on the periphery from productively engaging themselves in high income generating activities. Ultimately, this pattern leads to a polarized productive

resource ownership. Similarly, the polarization which stems from ethnic and linguistic diversity results in financial repression and becomes conducive for rent seeking for some groups at the expense of the welfare of the society at large (Easterly and Levine, 1997).

In estimating Equation (7) I follow the standard growth regressions models. *Income* denotes the initial level of GDP per capita which is often used to test for convergence among countries or regions. θ^{**} represents the average income inequality (Gini Index: 1985to1990) - instrumented by ethno-linguistic proxies. $X_{i,1965\text{-}1985}$ includes lagged economic, social and demographic country characteristics, which are briefly described below.

The *Economic* variables include the degree and extent of black market premiums to reflect the level of market distortions and the effects of parallel market on economic growth. This variable measured as a ratio of the black market exchange rate to the official exchange rate for the U.S. dollar. The degree to which parallel markets exist can be an indicator to the *unhealthiness* of a certain economy and also reflects the degree of openness. The black market or parallel market premium is included to see how it affects economic growth by creating price distortion and rent seeking behavior. Higher black market premium is expected to adversely affect economic growth. The level of external financial assistance (*Aid*) that the country received during the period of the study is also accounted for. This will capture the effect of foreign assistance on economic growth. Foreign aid is expected to spur growth in countries where there are *quality* institutions (which I control for).

The key demographic and social variables include country human capital level - represented by the gross enrolment rates at elementary, high school and higher education levels. The rate of urbanization, measured by the percentage of population who live in urban areas, is also included in this vector. It is expected to reflect the advantage or the importance of agglomeration economies as a result of spatial proximity of economic activities (e.g. firms in urban areas). Urbanization could foster specialization and creates a greater scope for knowledge spillovers and occupational mobility (Gallup et al., 1999; Duranton and Puga, 1999). Thus we expected a positive association between growth and urbanization. Life expectancy at birth is also among these demographic variables.

Furthermore, the variable (*Insti)* denotes the quality of economic and political institutions. The literature on measures of institutions enlists various indices including: The International Risk Guide used by Acemoglu et al. (2001), Aggregated Index of Government Effectiveness used by Kaufmann et al. (2003), and Polity IV data collected by Jaggers and Marshal (2000). More recently, historical data on early European settlers' mortality rate has also been used as an instrument to measure the quality of current institutions (e.g. Acemoglu et al., 2001). However, this paper employs the Freedom of House index of

political and civil liberties as a reflection of the reality in the quality of institutions in many developing countries.

The Freedom House measurement on civil liberties are intended to reflect the degree and extent of freedoms in a country that guarantee free speech, privacy and proper due process of law that enable economic agents to criticize the political, economic and religious system. This makes the Civil liberty index superior to the other measures; as it is difficult to have a country with high political rights but low civil liberties, which makes the right to vote less significant if opposition parties cannot effectively defend or address their case (Gastil, 1980). The ranking scale of countries on civil liberties ranges from 1 to 7 (a scale of 1 being the most freedom).[9]

The *Geography Variable (Geog)* covers the geo-ecological location of the country. That is, the percentage of land in the country that is located in the tropics. Country location is included to account for its influence on disease burdens and agricultural production. Region dummies are also included to account for unique regional characteristics.

The rationale for using different time spans for the main variables (growth- and inequality) and the other country specific variables is twofold. First, it is to explicitly account for the two-way causality between growth and inequality. Second is to mitigate other sources of endogeniety and ensure the model is as "conservative" as possible to obtain coefficients that are likely to represent long- term relationship with the dependent variables.

We turn now to Equation (8), the inequality regression. The dependent variable is income inequality (*gini*) (averaged from1985to1990). Growth (g^{**}) and other non distribution country specific demographic and economic factors are included to explain the variation in the level of income inequality among countries. Except for income inequality (the dependent variable) and growth measured as average values over the period 1985 to1990, all the other explanatory variables are averages for the period from 1965 to 1985. The use of lagged values of the non growth explanatory variables is intended to mitigate a potential endogeneity problem that might arise.

Similar to the estimation process of Equation (7), a set of instruments are used as proxies for growth which are deemed to affect the level of inequality indirectly through their effect on the level of growth. Distance to navigable rivers or ice-free seacoast is used as a proxy for growth. The distance variables are measured from the centroid of the country. The economic *rationale* behind using this proxy is that

[9] It should be noted here that to mitigate the problem of endogeneity that stems from the argument that these measures of institution can be outcomes rather than causes for economic growth, a lagged average value civil liberties index over the period (1965-1985) is used.

proximity to navigable rivers or seacoasts fosters access to trade with other countries and opens the door for technology diffusion. This affects growth directly through the level of productivity and transport costs (Gallup et al., 1999).

To account for the mean reversion and any other lagged adjustments, the level of initial gini ($\theta_{initial}$) is included. In the long run, a country's high level of initial income inequality is expected to have a positive association with inequality. This is because persistence of higher initial level of inequality over time tends to propagate the initial distribution over time (Sylwester, 2003).

Furthermore, the vector (X^G) includes the average level of foreign assistance to GDP ratio and urbanization rate. In addition, ethnic and linguistic fraction measures are also included in this vector. Particular attention is given to ethno-linguistic variables in this regression. For these two measures of diversity to be *good* proxies for inequality in the previous growth regression, they should exhibit a significant explanatory power over income inequality.

Finally, after estimating equations (7) and (8), I acquire the predicted values of inequality (θ^*) and growth (g^*). Then these predicted values of growth and inequality are used in the poverty regression (equation (9)). Growth is expected to reduce poverty while income inequality is expected to exhibit a direct (positive) association with poverty.

Other explanatory variables (X^P) in this regression include the dependency ratio, measured as the ratio of population below the age of 15 and above 65 to reflect the consumer/worker ratio in the country. To capture the intergenerational nature of poverty and its long-run persistence, the lagged poverty level (1965 to 1985 average) is included. Human capital, foreign assistance (Aid) as percentage of GDP, urbanization rate and the geographic variables discussed above are also accounted for.

The poverty equation (9) is estimated using two different techniques. First equation (9) is estimated using the standard global parameter estimation: ordinary least squares (OLS). Next I re-estimate this poverty equation using the geographic weighted regression (GWR) scheme, which unlike OLS, produces parameter estimates for each country. The OLS estimates are used for the purpose of validation and comparison.

The estimation procedure in GWR is as follows:

Given the traditional regression model:

$$Y_i = \beta_0 + \Sigma_k \beta_k X_{i,k} + \varepsilon_i \qquad (10)$$

The global parameter coefficient β is given by $\beta = (X'X)^{-1}(X'Y)$. However, in GWR the regression model it is modified to take the following form:

$$Y_i = \beta_0(\omega_i, \acute{\omega}_i) + \Sigma_k \beta_k(\omega_i, \acute{\omega}_i) X_{i,k} + \varepsilon_i \quad (11)$$

Where $(\omega_i, \acute{\omega}_i)$ are geographic co-ordinates of country *i*. Thus GWR estimate β is given by:-

$$\beta(\omega_i, \acute{\omega}_i) = (X'W(\omega_i, \acute{\omega}_i)X)^{-1}(X' W(\omega_i, \acute{\omega}_i)Y).$$

Where W is an n by n matrix whose off-diagonal elements are zero and whose diagonal elements denote the geographical weighting of observed data for country *i*. It is a continuous function of the distance between geographic centroids of neighboring countries, $D_{i,j}$. The range of spatial dependence is determined by the weight matrix. Such distance decay weighting is a way of allowing nearby countries or regions to exert a greater influence than those more distant. The diagonal elements of the weight matrix, $\boldsymbol{Wi} = diag(wi1, wi2, \ldots, win)$, are defined by a Gaussian decay function which are spatially adaptive kernels. The distance weight matrix is given by:

$$W_{i,j} = exp\left(1 - D_{i,j}/h^2\right)^2 \quad , \text{ if } D_{i,j} < h_i \, . \quad (12)$$

Where, h is the cut-off distance or the bandwidth for observation *i*. In other words, $w_{ij} = 0$ when $D_{ij} > hi$, where $d_{i,j}$ is the distance between countries *i* and *j*. In this respect, the regression weight quickly declines when the distance between countries increases.[10]

GWR is a relatively new technique in spatial econometrics and its use will allow the influence of the poverty, growth and inequality determinants to vary across countries. Thus, using GWR avoids the problem of ecological fallacy and modifiable aerial root problem that emanates from aggregation and scaling.[11] Some other key advantages of using GWR are that it allows for controlling country fixed effects, mitigation of multicollinearity, and that it potentially offsets the presence of outlier estimates. Thus, unlike the previous cross-country poverty studies, I estimate country specific poverty-growth and inequality interaction estimates and explain the variation of poverty reduction successes and its determinants across the 56 developing countries in a more complete way.

1.4 Data Sources and Descriptive Statistics

The analysis of the empirical relationship between poverty and growth and inequality in these 56 sample developing countries is based on data sets constructed using various data sources. Region wise, the complete data includes 24 Sub Saharan African, 4 North African, 18 Latin American, 5 East Asian and 5

[10] For detailed discussion on the weight matrix and geographic weighted regression, see Fotheringham et al. (2002).
[11] Inferences about a country can be made based on aggregated models; these inferences can be affected by boundary choice for the units of observation.

South East Asian countries. Most of the data is extracted from "*Data set for a Panel of 138 Countries*" by Barro and Lee (1994) quinquennially for the years 1960- 1990. The data is composed of entries in national income accounts, education, population, purchasing power parity (PPP) deflators, political variables and trade policy variables.

The main dependent variable, the head count poverty rate measured by a dollar a day, is derived from World Bank's Poverty Monitoring Database (PovcalNet)[12] and World Development Annual Indicators (WDI).[13] The poverty data is based on time series representative household surveys. This head count measure of poverty is conservatively anchored to reflect the level of poverty in low income countries; it is also adjusted by using international purchasing power parity (PPP) to account for the cheaper costs of non traded goods in low income developing countries and ensure compatibility across countries (Chen and Ravallion, 2007).[14]

The data for income inequality is acquired from the United Nations University NU/WIDER World Income Inequality Database (WIID) information for developed, developing, and transition countries. This database is also an extension to the Deininger & Squire (1997) database on income distribution. The main problem with this data is the inconsistency in the time intervals of the household surveys across countries. Thus, the data that fall in the interval period between 1965 to1990 are considered.

Geographic variables such as the distance from centroid of country to nearest coast or navigable river (in kms) and percentage land area in geographical tropics were acquired from Gallup et al. (1999). The remaining country specific information is taken from the websites of respective countries.

1.4.1 Descriptive Statistics

Figure 1 shows the geographic distribution of poverty rates (percentage of population living under a dollar a day for the period from 1985 to1990) across - Africa, Asia and Latin America. The mean average poverty rate across these sampled 56 countries over this period is around 25%. Thus, countries with poverty rates less than 5% are labeled as very low poverty rate countries, 5% -15% as low, 15-25% as medium, 25-40% as high and those with 40% and above as very high poverty countries. Figure 1 shows that most of the high and very high poverty rate countries are situated in Sub-Saharan Africa and East

[12] This is available online on the World Bank web site http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp.
[13] For countries such as Nepal, India and Argentina where the World Bank database shows only rural or urban rates, thus data is acquired from national statistics offices these countries or from other published poverty research data such as Adams (2004) and Iradian (2005).
[14] The poverty line is set at $1.08 per person per day in 1993 international purchasing power parity exchange rate. That is, by pricing a representative bundle of goods in each country and comparing it with the local cost of that bundle with the U.S. dollar cost of the same bundle.

Asia. On the other hand, most Latin American countries fall under the low poverty rate category, while the Southeast Asian countries fall under the medium range poverty rate.[15]

Similarly, Table 1.1 shows that the growth level over 1985 to1990 is lower in Sub Saharan Africa and Latin America compared to the other regions. However, the level of income inequality is historically higher in Latin American countries followed by Sub Saharan Africa, East Asia, and North Africa and lowest in South Asia for the same period. Interestingly, the share of aid to GDP is above the mean in both Sub-Saharan and Northern African countries. The mean ethnic diversity is highest in Southeast Asian countries followed by Sub Saharan Africa. The mean percentage of population who do not speak the most widely spoken language is the highest in Sub-Saharan Africa.

Compared to the rest of the regions, Sub-Saharan Africa lags in urbanization rate, educational enrolment rates, quality of institution and life expectancy. Moreover, 37% of the 7 % land locked countries in the total sample are from Sub Saharan Africa. Finally, the mean distance from the centroid of a country to nearest coast or sea-navigable river is 310 Kms. This distance is the closest for East Asian countries (91Kms) compared to the most economically distressed countries in Africa where the mean distance is way above average (around 526 Kms). Distance to the nearest seacoast is measured from the centroid of the country rather than from the largest city. This is due to lack of data to calculate the distance from the largest city in the country. This inspection of the descriptive statistics of these sample countries provides a hint of the geographical dynamics of poverty and economic development in developing countries.

1.5 Regression Results

The regression results in this section are presented in two parts. The first is the cross-country growth-inequality relationship examined using two stage least square (2SLS) estimation where equations (7) and (8) are empirically estimated in a non-spatial context. The second part presents the results from the geographically weighted regression of equation (9). The results of the two regression models are discussed below.

1.5.1 Growth-Determinants

Table 1.2 depicts the two stage least square growth regression. The results of the estimated coefficients of the variables are discussed below:-

Initial per capita Income (Income): The coefficient for the initial per capita income is statistically significant with a negative sign (convergence), indicating that growth is affected by the level of initial

[15] The category used in classifying countries as Low, Medium and High poverty rates is based on data mean and the standard deviation. It is not based on any official category.

income and countries with lower initial per capita income tend to grow faster than relatively richer countries, *ceteris paribus* (Barro and Sal-i-Martin, 1995).

Income equality (Gini): The coefficient of income inequality is negative and statistically significant. This result is consistent with the previous findings that document the adverse effect of inequality on growth in developing countries (Anand and Kanbur, 1993; Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Perotti, 1996; and Deininger and Squire, 1996). The prevalence of constrained credit market in high inequality countries might block poor households from acquiring credit for investing in human and physical capital which ultimately impedes economic growth. In addition, the level of inequality can also affect growth though diminishing social capital (creating social unrest) (Barro, 2000).

In order to test the validity of the ethno-linguistic variables used as instruments for income inequality the over-identification test (Sargan Test) is performed. This is to verify that the instruments used are uncorrelated with the dependent variable (*growth*) and the error term from the IV regression. That is, for the instruments to be acceptable, regressing the error term from the IV regression on ethnic fraction, linguistic fraction and the other exogenous explanatory variables should render R-square statistic close to zero. The over-identification test result is presented on the bottom of table 1.2. It shows that the null hypothesis that all the instruments are orthogonal to the error term cannot be rejected at conventional levels of significance (p-value = 0.69). This confirms the validity of these instruments. However, it is also important to test for a second criterion, instrumental relevance. Stock and Yogo (2005), suggest that many applications of instrumental variables (IV) regressions suffer from "weak instruments" or "weak identification". The last line of Table 1.2 reports the Cragg-Donald Wald F-statistic for the weak instruments test of Stock and Yogo (2005). Statistical significance based on the Stock-Yogo critical values indicates the instruments are slightly strong.[16]

Institutions: The negative and significant sign in the regression coefficient for Civil Liberties index indicates that a high degree of initial civil liberties (lower index) predicts stronger subsequent economic growth. This suggests that, fewer economic and political constraints on individuals and other economic agents (but the government) fosters the consolidation of property rights, security and leads to pro-investment environment which bolster growth.[17]

[16] The partial R-square of the regression excluding the instruments is 0.48 and the test of excluded instruments can be rejected at the 1% level of significance (F=5.9). However, the test statistic is based on Cragg and Donald's (1993) which tests the null hypothesis of under-identification.

[17] To check for the persistence of institutions over time, sensitivity analysis was conducted by regressing the level of institutions on lagged growth rate (15 years) (not reported). The dependent variable was the level of civil liberties (measure of institution) averaged over the period from 1985 to1990 on the level of growth for the period from 1965 to 1970. The coefficient of growth was found to be insignificant indicating that institutions are persistent over time. Furthermore, the over-identification test implicitly indicates that the measure of institution as an explanatory variable is uncorrelated with the error term.

Life Expectancy: Many cross-country growth or development studies have documented that improved health facilities (measured by life expectancy or mortality rate) has a strong positive association with long-term growth. For instance, Sachs and Bloom (1998) associate low life expectancy with lower investment and savings which eventually retards long term growth. Similarly, the regression result shows that higher average life expectancy is correlated positively with growth. Specifically a 1% growth in life expectancy leads to around 0.3 % increase in growth level. To this effect promotion of health care services to the poor should be at the center of development issues in Asia, Africa and Latin America.

Geography Variables: In order to account for the effect of geography in the level of growth across countries the percentage of land that lies in tropics is included. After controlling for the quality of institutions and other demographic and economic variables, this geographic variable is insignificant. This is consistent with the findings of Acemoglu et al. (2002). These results suggest that the effect of time invariant location and climate factors could vanish once countries adopt higher-quality institutions and pursue more open and productive economic policies. Finally, region dummies are also included to control for some uncontrolled region specific factors.

***Urbanization Rate*:** The coefficient of urbanization is found to be negative but insignificant at conventional levels of significance. This estimation assumes a linear association between growth and urbanization. However, there have been some questions as to whether there exists an optimal level of urbanization particularly in the case of developing countries, and this has been coined as "over urbanization" (Henderson, 2003; Bertinelli and Strobl, 2003). Hence, the degree of urban concentration might diminish the positive agglomeration effects.

Foreign Assistance (Aid): The role of aid in spurring growth has been highly contentious. Several studies have come with conflicting results. After controlling for the level of civil and political liberties, the coefficient of aid has been found to be negative and significant. But in theory, foreign assistance to poor developing countries has been viewed as a means of bridging the financial gap faced by developing countries in acquiring physical and human capital that are key for economic growth. Nonetheless, it might hinder domestic saving rather than replacing them by creating domestic market distortions and growth taxing rent seeking behaviors (Moriera, 2005; Karras, 2006).[18]

Black Market Premium: The real economic value or opportunity cost of resources in many developing countries with missing or failed markets is well reflected in the prices found in the parallel markets. The foreign exchange market is a point in case. This coefficient was found to be negative but statistically

[18] Chatterjee and Turnovsky (2004) find that these lump sum transfers of money retard growth in the recipient countries. Yet, Burnside and Dollar (2000) find that the effectiveness of aid differs from country to country depending on whether the recipient country is pursuing good economic policies.

insignificant. The crux here is since these coefficients reflect the long-term link, parallel markets might affect growth in the short run; however, in the long run, enough restructuring in the economy might eliminate the negative impact of black market premiums on growth.

Human Capital: The human capital variables were found insignificant except for primary education (with a negative sign) in shaping the long-term growth in developing countries. This is contrary to the *a priori* expectation. This could be due to that fact that the return to education in developing countries is low and that investment in human capital in developing countries should be complimented with better public infrastructure and open trading environment (Mankiw et al. (1992).

Column 2 of Table 1.2 reports the results of sensitivity analysis that includes an interaction variable of initial income level and gini. This is to confirm whether the effect of income inequality on growth varies across developing countries in different levels of development (income levels). The interaction term is positive but statistically insignificant. Nonetheless, the positive sign indicates that the negative effects of income inequality on growth might start to vanish as the level of income rises. This result is consistent with the findings of Anand and Kanbur (1993). The data do not support the existence of a turning point for the negative effect of income inequality on growth across the sample developing countries. [19]

1.5.2 Income Inequality Determinants

Table 1.3 presents, the second instrumental variable regression for income inequality (gini). In this regression, the coefficient of growth is found to be negative but insignificant at conventional levels of significance. This is consistent with the empirical findings of Ravallion and Chen (1997), Ravallion (2001) and Dollar and Kraay (2002). Hence, narrowing the inequality gap between the poor and the rich warrants policies that go beyond generating high levels of growth. These policies should also include optimal restructuring of resource ownership or creating a ground for the *disadvantaged* to have access to productive assets and growth generating endowments.

Furthermore, to verify the validity or the exogeneity of the instruments used for growth, the Sargan over-identification is performed (reported at the bottom of Table 1.3). The test result shows that the null hypothesis that the instruments are exogenous cannot be rejected at conventional levels of significance (p-value = 0.11). However, the Cragg-Donald Wald F-statistic for the weak instruments test of Stock and Yogo (2005) indicates that the instruments are only marginally relevant.

[19] In a sensitivity regression (not reported), I include the squared term of gini to assess nonlinear inequality effects on growth. However, the quadratic coefficient is insignificant.

With regards to the measures of societal heterogeneity (ethnic and linguistic diversity), the language variable (percentage of population who do not speak the most widely used language) is positively associated with inequality and is statistically significant. Contrary to our expectation, the ethnic diversity coefficient is negative and significant. Thus, the data indicates that ethnic diversity might not be a problem as long as people can communicate with a common language. That is, linguistic homogeneity appears to be more central in minimizing mistrust and reducing additional friction in the day-to-day communications of individuals from cross sections of ethnic groups. For example, Leigh (2006) notes that more than ethnic fraction, linguistic heterogeneity has the potential to create equilibrium in which payoffs fall as the quality of information declines due to language barriers.

Most developing countries are well known for having an economy with two different systems where a relatively advanced urban economy co-exists with a traditional mostly agrarian rural economy. To account for this economic system dichotomy, the level of urbanization is included. However, the estimated coefficient of urbanization rate is not statistically significant in the income inequality equation.[20]

This section has described the determinants of growth and inequality with the purpose of understanding their dynamics and more importantly addressing their reverse causality. The next section discusses the global and geographical weighted regressions of poverty. Emphasis will be on the responsiveness of poverty to growth and inequality across developing countries.

1.5.3 Poverty: Geographical Weighted Regression Scheme

This section discusses the results of the poverty regression from the geographically weighted regression scheme and OLS. The dependent variable is the average poverty rate from 1985-1990, measured as the percentage of population below a dollar a day poverty line. The main explanatory variables are the predicted values of growth and gini (both in 1985 to1990 averages) from the previous instrumental variable regressions of growth and inequality.

These results are presented in table 1.4. Basic comparison of OLS and GWR results indicates that the GWR regression significantly improves the explanatory power of the poverty regression by raising the adjusted R-square from 0.74 to 0.85.

The OLS results are non-spatial; the coefficients show the average influence over all developing countries. The GRW results are a relative location analysis which account for both spatial

[20] In a regression (not reported), the percentage of land that lies in tropics was included to explain income inequality. However, the coefficient of the variable was found to be statistically insignificant in explaining the persistence of income inequality.

interdependence and location effects. For example, unlike the OLS results, GWR estimates take into account the spatial non-stationarity within the global parameters and unravel the potential spatial dependence of the data. The rationale here is that, a country (for e.g. located in Sub-Saharan Africa) may have an extra "*penalty"* because of its poor neighbors and due to loss of potential trade and technology transfer opportunities, as well as other regional instabilities that may loom across borders. The GWR results stress on the geographic variability of the marginal effects of the explanatory variables with a special focus on growth and income inequality for the purpose of policy relevance and cross-country poverty understanding.

First, I briefly discuss the global (OLS) results of the poverty regression that empirically relates the cross country poverty rates with the above mentioned explanatory variables. It should be noted here also that except for the coefficient of the lagged poverty level, all the coefficients are partial elasticities (Log linear model).

Lagged poverty rate has a positive association with the subsequent poverty rate and is statistically significant at the 1% level. This reflects inter-household poverty transmission, and long run persistence of poverty from one generation to the next. With regard to human capital, primary and secondary school enrolment rates have a negative sign with only secondary school enrolment being statistically significant, whereas the higher level education enrolment rate is found to have a positive association with poverty. This can be attributed to the low returns to education in developing countries and the existence of high level of unemployment. However, this in no way undermines the role of education in fighting poverty once adequate infrastructure and investment are made to promote employment growth (Bigsten et al., 2003; Deininger and Okidi, 2002). This is particularly important for the rural poor where access to basic education without other complementary investments might trigger rural-urban population migration, ultimately leading to urbanization of poverty.

The other demographic variable accounted for is the *Age Dependency Ratio*. This ratio measures the population proportion under 15 and over 65 years old; where a country with higher dependency ratio is expected to have higher poverty rate. However, after controlling for other demographic, economic and geographic variables, the coefficient of this variable is negative and significant. As for the foreign assistance coefficient, after controlling for the level of growth and income inequality, there is a positive and insignificant association between aid and poverty. However, this result is a global estimate; thus, the partial effect of foreign assistance might differ from one country to the other.

Similarly, the level of urbanization is associated negatively with poverty. Higher level of urbanization gives access to relatively higher paying jobs compared to the agriculture -centered rural sector.

Nonetheless, over urbanization could lead to development of urban slums, which might lead to pockets of highly impoverished places in many developing countries. However, since the focus is on measuring absolute poverty, urban areas still fare better in relation to remote rural areas since the standard of living in urban areas are relatively higher compared to their rural counterparts. On the other hand, UN statistics reveals that the urban share of population in developing countries is increasing and might lead to urbanization of poverty (Haddad et al., 1999; United Nations, 1996). Yet, majority of the poor will live in rural areas long after most people in the developing world live in urban areas (Ravallion, 2001).

Finally, the discussion will focus on to the two main variables of interest: ***Growth*** and ***Inequality***. The coefficient *gini* is positive and significant at the 10 % level of significance. The partial elasticity of poverty with respect to income inequality is estimated around 0.01. The total elasticity of poverty with respect to income inequality then becomes 0.01% (the estimated parameter multiplied by the ratio of mean poverty to mean income inequality). That is, a 10 % decline in income inequality will generate 0.1% decline in the rate of poverty. Our conservative estimate is lower than the estimate by Kawija and Verschoor (2007), who found the average elasticity of poverty to income inequality to be around 0.8 % in developing countries, albeit for the mid 1990s.

Therefore, if income inequality retards growth in developing countries, optimal income redistribution policies will not only help generate enough growth, but also accrue an extra dividend in terms of speeding the poverty reduction process. That is, higher initial inequality can cripple the effect of higher income growth on long-run poverty reduction (Bourguignon, 2003).[21]

With regards to growth, the OLS estimate shows that its coefficient is negative as expected and significant. Thus the global estimates indicate that growth is a core driving factor in reducing absolute poverty. The partial global elasticity of poverty to growth is estimated to be around -0.09. The elasticity calculated based on the mean poverty rate and mean growth rate is around -3.22. That is a 10% growth in income will reduce poverty by slightly more that 30%. This is consistent with the poverty elasticity to income growth found by Adams (2003) and Chen and Ravallion (1997). More interesting is the fact that this estimated elasticity is a global mean - it puts all countries that have exhibited a decline in inequality and a growth in income as well as those with a rise in inequality and income. In both scenarios, poverty

[21] The correlation between poverty and inequality and the predicted value of inequality is -0.10 and -0.15 respectively. This indicates that poverty and inequality are not mechanically related when considering a dollar-a-day poverty line. Furthermore, to investigate if poverty and inequality are mechanically related, in a regression not reported, income inequality was dropped from the poverty equation. As a result, the coefficient of growth slightly increases and the R-square declines. However, generally the regression coefficients are not very sensitive to omitting inequality from the regression.

falls but at different rates. Hence, this leads us to the next step of decomposing these global estimates by country and region using GWR scheme.

The GWR results portray a more complete picture compared to the OLS results. As mentioned in the previous sections, one of the key advantages of the geographically weighted regression is that it provides finer pattern by showing the local significance of variables which could be insignificant in the global regressions (OLS) by offsetting one another. However, for brevity I only present a summarized output of the GWR scheme. The summary statistical descriptions of the estimated coefficients include the Maximum, the Minimum, the Upper Quintile, and the Lower Quintile and the Median. This will paint a clearer picture on the variation in the magnitude of the estimated parameters across countries.

More importantly, the GWR approach yields not only the local estimate of each regression coefficient, but also tests for spatial heterogeneity among all the estimated parameters for each explanatory variable based on a Monte Carlo significance test procedure (described in Fotheringham et al., 2002 and Charlton et al., 2003). Particularly important here is whether a 10 % rate of economic growth would have a similar poverty reducing effect across countries. The summary results from the GWR are presented with a special focus on the median of the estimated parameters and the Monte Carlo spatial heterogeneity test. The results are discussed below by each regression variable.

Initial Poverty level: Similar to the OLS outcome, in this spatial regression, the level of initial poverty level has a positive association with the subsequent poverty rate. The coefficient in the OLS regression is 0.41 whereas the median lagged poverty parameter estimate from the GWR is 0.69. Figure 2 shows the geographic distribution of this parameter across Africa, Asia and Latin America. It depicts that above median lagged poverty burdens on poverty reduction are mostly exhibited by Sub- Saharan Africa, East Asian countries and Yemen, Egypt and Tunisia. The lagged poverty burden is relatively moderate in West Africa. On the other hand, the intergeneration transmission of absolute poverty is very low in Southeast Asia and the northern part of Latin America (in countries such as Brazil, Venezuela, Guyana, Peru, Ecuador and Bolivia). The Monte Carlo significance test confirms that there is no systematic spatial heterogeneity in this parameter.

Human Capital and Poverty: The role of human capital measured by educational attainment/enrolment in reducing poverty is well documented. However, unlike with the OLS results in the GWR, some human capital variables have an unexpected positive sign. The median for primary, secondary and higher education enrolment rate are all positive. However, in terms of spatial heterogeneity, only the primary education enrolment rate exhibits a statistically significant geographic variation (see Figure 3 for the geographic heterogeneity of this parameter). The coefficient of primary education enrolment rate is

negative for most of Sub-Saharan African countries such as:- Algeria, Burkina Faso, Burundi, Cameroon, Ethiopia, Gambia, Ghana, Cote d'Ivoire, Mali, Mauritania, Niger, Nigeria, Rwanda, Senegal, Sierra Leone and Uganda where the average literacy rate is historically very low. Similarly, in none of the East and South Asian countries is the coefficient negative. On the other hand, among the Latin American countries such as: - El Salvador, Jamaica, Mexico, Panama, and Nicaragua, the primary enrolment rate coefficient is negative.[22]

One can conclude that the poverty-human capital association would vary depending on the average education attainment level and on the skill demand in the labor markets of respective countries. Hence, provision of primary and secondary education along with other public infrastructure provision in countries where the level of literacy is *lower* would pay higher dividends in fighting poverty.

Urbanization and Poverty: With regards to the rate of urbanization, the median GWR result confirms a negative association with poverty. The coefficient of urbanization rate is positive only in 6 countries (Mexico, Bangladesh, Indonesia, Malaysia, Philippines and Thailand)[23] out of the 56 developing countries included in the study. The statistical significance of urbanization rate indicates the existence of *lower* absolute poverty rate in urban areas of many developing countries compared to the traditional rural agrarian areas. Perhaps the existence of urban wage premium and better employment access in urban areas might contribute to a lower poverty rate. The results also confirm that there is no systematic geographic variation in the effect of urbanization on poverty (see Figure 4).

Foreign Assistance and Poverty: The level of foreign assistance (Aid-GDP ratio) has a negative association with poverty in the GWR scheme. Surprisingly, the coefficient of aid in local parameter estimation is only positive in various Latin American countries. Most Sub-Saharan and Asian countries exhibit a negative poverty aid association. Specifically, all Southeast Asian countries and Ethiopia and Madagascar among Sub Saharan African countries, exhibit negative effects of aid on poverty that are above the median (see Figure 5).

Aid can help recipient countries in providing public infrastructure and access to quality services such as health care and education. However, the effect becomes more pronounced when foreign assistance is coupled with pro-poor rural centered economic policies (e.g. the paradigm shift in Ethiopia's

[22] The secondary education enrolment rate is also negative for many Latin American countries (El Salvador, Jamaica, Uruguay, Nicaragua, Panama, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru and Venezuela) and some Asian countries such as Bangladesh, Indonesia, Malaysia, Nepal, Philippines, and Thailand. On the other hand, higher education has a negative sign for countries such as: Morocco, Bangladesh, India, Indonesia, Malaysia, Nepal, Philippines, Sri Lanka and Thailand. This is the case mostly East and South Asian countries where the level of literacy is traditionally higher compared to Sub-Saharan Africa and Latin American countries.

[23] These countries have an above average rate of urban population compared to the entire sample.

development policy that now focuses more on the rural poor has been gaining some success (Dercon, 2005).[24]

Growth and Poverty: As has been noted in the earlier sections, growth is a fundamental component of poverty reduction. Hence, the growth parameter and its geographic variation in magnitude are of particular interest. The focus here is to see how the partial elasticity of poverty to growth varies across countries.

Similar to the OLS poverty regression outcome, the median coefficient estimate of growth in the GWR is negative. Surprisingly, the OLS partial elasticity magnitude (-0.09) and the GWR coefficient are similar in magnitude. Particularly interesting is the GWR coefficient of growth is negative across all countries except Latin American countries where the initial level of inequality is historically the highest compared to the other regions. Latin American countries may have experienced some economic growth over this study period; however, the relatively higher level of income inequality might have choked off the favorable effects of growth.

The test for geographical variation of the coefficient confirms that there is a significant systematic variation in the effect of growth at the 1% level of significance. The maximum poverty partial elasticity to growth is -1.61 (in Philippines), whereas opposite highest positive effect is exhibited in Mexico (0.12). Mexico has above average level of income inequality even compared to the high income inequality countries. Hence, this clearly shows the adverse effects of income disparity.

One of the main objectives of this paper is to go beyond the average growth elasticity of poverty documented in previous research. Therefore, in order to get a clear picture concerning the spatial variation of the growth component, I mapped the distribution of the GWR growth coefficient for all the 56 countries. Figure 6 shows that South Asia, East Asia, and North African countries exhibit a high poverty reducing growth effects compared to Sub- Saharan Africa. Surprisingly, Venezuela is the only Latin American country with a negative coefficient of growth.

Inequality and Poverty: As noted in the previous global estimation of the poverty and inequality relationship, high levels of inequality can be a hindrance to the poverty reduction process by reducing the favorable effects of growth. Similarly, the GWR result shows that the median partial elasticity of poverty to inequality is 0.001 compared to OLS estimate 0.02. Thus, the GWR outcome underscores a smaller effect of income inequality. The Monte Carlo test of heterogeneity shows that the partial elasticity coefficient of income inequality exhibits a systematic geographic variation across countries. The

[24] The Monte Carlo test for geographic variation indicates that the null hypothesis that effectiveness of foreign assistance in poverty reduction is uniform across countries cannot be rejected at conventional level of significance levels.

hypothesis that there is no spatial heterogeneity in the coefficient of *gini* across developing countries can be rejected at the 1% level of significance. This can be confirmed by a glance at Figure 7, which depicts the geographic distribution of the inequality coefficient across the four regions. It clearly shows a very high adverse impact of income inequality among Latin American countries. Conversely, the effect of inequality is lowest in East and South East Asian Countries.

1.6 Conclusion and Policy Implications

The fundamental question raised in this paper is whether economic growth helps lift all "boats" across countries uniformly? Before addressing this issue, I assessed the determinants of growth and income inequality across countries, since proper understanding of growth–inequality relationship has an important implication for poverty and related policies. In doing so, I first address the two-way causality relationship between growth and inequality. Consistent with previous studies on income inequality and growth in developing countries, I find that higher initial income inequality retards growth. In addition, I find that quality institutions have higher explanatory power than geography and climate. As a result, developing countries should strive in improving the quality of Civil liberties to ensure a well-defined property rights and other individual civil rights which are fundamental in guaranteeing a sustainable long –term economic growth.

Furthermore, I find that growth has a limited effect on the level of income inequality. Socio-economic fabric of the society, more specifically ethnic and linguistics diversity are central in shaping the level of income disparity. Particularly, linguistic diversity plays a central role in how income inequality can persist. Thus, if growth alone cannot correct income disparity, this calls for public policies designed to promote optimal reallocation of resources. This will be helpful in augmenting economic growth by reducing the brake which emanates from inequality.

Next, the paper examines the determinants of poverty rate variation across developing countries in a spatial manner using Geographic Weighted Regressions (GWR). In comparison to OLS estimation, GWR improves the explanatory power of the poverty regression by raising the adjusted R-square from 0.74 to 0.85. The results from this spatial estimation also indicate that growth is the central driving factor in reducing poverty. Income inequality on the other hand has a positive association with poverty. Besides, both the partial elasticity of poverty to growth and inequality exhibit significant systematic geographic variation across countries.

The effect of growth on poverty reduction is highest in South and East Asian countries compared to Sub-Saharan Africa and Latin American Countries where the level of income inequality is relatively higher.

Therefore, addressing the problem of income inequality will have double dividends as it will have a positive effect on growth and facilitate the poverty reduction process at the same time.

Achieving high and sustainable economic growth should remain the central policy issue in developing countries. Nonetheless, with highest shares of poverty in developing countries being in rural areas, countries in Africa, Asia and Latin America should promote rural oriented growth strategies that target in provision of education, and other infrastructure facilities in rural areas along with creation of labor intensive jobs for the poor to actively participate in the growth generation process. Thus, to accelerate the process of poverty reduction, policy makers should focus on growth strategies which are pro-poor coupled with redistributive public policies that foster the leverage of the bulk of population in the lower tail of the income distribution.

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Table 1.1 Descriptive Statistics

Variables[a,b]	All Regions		Sub-Saharan Africa Countries		Latin American Countries		East Asian Countries		South East Asian Countries		North African Countries	
	Mean	St. dev	Mean	St. dev	Mean	St. dev	Mean	St. dev	Mean	St. dev	Mean	St. dev
Poverty (1985-1990 Average)	28.12	17.85	43.52	17.31	8.17	7.02	15.08	6.49	37.34	12.04	2.67	2.67
Lagged Poverty (1965-85 Average)	33.35	17.65	46.94	16.96	10.28	6.20	24.73	6.96	43.47	8.36	2.92	1.15
Growth (1985-90 Average)	2.54	2.40	0.45	2.26	-0.27	2.03	4.35	2.37	3.73	0.81	1.79	2.26
Gini (1985-1990 Average)	38.38	10.01	44.89	7.63	53.62	6.62	38.25	8.67	31.31	1.83	34.92	5.83
Gini (1965-1985 Average)	38.92	9.83	46.16	10.41	52.47	6.24	39.31	7.97	31.76	2.06	39.03	1.28
Income per Capita (1985-1985 Average)	1403.08	1168.63	740.23	305.94	3540.73	1157.49	1343.74	540.95	810.67	163.13	1589.82	446.65
% Aid -GDP (1965-1985 Average)	6.33	9.87	18.06	18.17	1.31	3.61	2.59	0.44	4.73	3.20	17.37	17.02
Black Market Premium (1965-1985 Average)	0.38	0.40	0.61	0.88	0.22	0.21	0.11	0.07	0.44	0.18	0.55	0.35
Urbanization Rate (1965-1985 Average)	29.01	17.72	17.69	8.47	62.43	9.90	23.02	8.84	20.64	4.60	40.12	7.77
Dependency Ratio (1965- 1985 Average)	1.23	0.25	1.15	0.19	1.38	0.21	1.13	0.14	1.17	0.22	1.81	0.29
Population (1965-1985 Average)	274120	279167	30199	26945	59668	43129	95612	56192	499939	260860	24528	13473
Life Expectancy At Birth (Years) (1965 -1985 Average)	52.79	6.03	46.23	3.25	62.3	3.78	54.91	5.23	50.46	2.75	54.16	3.04
Primary Education Enrolment Rate (1965-1985 Average)	0.78	0.18	0.56	0.22	0.95	0.05	0.9	0.06	0.74	0.14	0.75	0.15
Secondary Education Enrolment Rate (1965-1985 Average)	0.27	0.11	0.11	0.06	0.35	0.09	0.3	0.14	0.27	0.07	0.31	0.14
Higher Education Enrolment Rate 1965-1985 Average	0.07	0.05	0.01	0.01	0.11	0.05	0.08	0.09	0.07	0.02	0.08	0.05
% Ethnic Fraction[c]	66.61	29.16	75.08	21.48	19.72	16.92	73.65	4.28	83.75	11.34	22.95	24
% Language Fraction[d]	47.51	30.41	65.53	22.51	4.25	11.01	55.31	16.59	59.82	25.18	8.94	10.63
Distance to navigable river / Seacoast (KM)	309.69	193.37	525.77	253.09	240.68	86.89	91.40	69.27	335.64	152.77	308.39	257.74
Landlocked Countries %	7		37		3		0		2		0	
N	56		24		18		4		5		5	

a All the variables are weighted by population.

[b] For data source, please refer text under the topic Data Sources and Descriptive Statistics in page 14.

[c]Ethnic fraction measures the probability that two randomly selected individuals will belong to two different ethnic groups.
[d]The language fraction measures the percentage of population that cannot speak the most widely used language in the country.

Table 1.2 Two stage Regression of Growth Equation

Variables [a,b]	Basel Line Model	Add: Initial Gini and Income Interaction
Gini (1990-1965 Average)[c]	-0.17	-0.25
	(-1.82)	(-1.66)
Civil Liberties Index (1965-1985 Average)	-1.49	-1.45
	(-2.82)	(-3.02)
Initial Per capita Income (1965-1985 Average)	1.3-E03	-2.96E-03
	(-2.26)	(-2.11)
Interaction (Initial Income and Initial Gini)		4.28E-05
		(1.58)
% Aid -GDP (1965-1985 Average)	-6.73	-5.22
	(-1.95)	(-1.39)
Life Expectancy At Birth (Years) (1965 -1985 Average)	0.34	0.26
	(-2.41)	(2.43)
Higher Education Enrolment Rate (1965-1985 Average)	-7.75	2.11
	(-0.80)	(0.17)
Secondary Education Enrolment Rate (1965-1985 Average)	-4.18	-4.13
	(-0.62)	(-0.57)
Primary Education Enrolment Rate (1965-1985 Average)	-6.97	-6.91
	(-2.53)	(-2.47)
Urbanization Rate (1965-1985 Average)	-0.03	N
	(-0.56)	
Black Market Premium	-0.67	N
	(-0.92)	
% Land in Tropics	-0.38	-0.47
	(-0.23)	(-0.30)
Region Dummy[d]	Y	Y
Centered R- Square	0.68	0.68
Number of Observations	56	56
Sargan statistic (over-identification test of all instruments):[c]	1.03	3.03
Weak Instrument. Wald	6.77 [e]	4.93[f]

[a] The dependent variable is growth (1985-1990 average)
[b] The values in parenthesis are t-statistics.
[c] In this Two Stage Least Square Estimation Gini (1985-1990 Average) is instrumented by language and ethic fraction. The Sargan statistic in both column 1 and 2 are not significant at the 10% levels.
[d] The region dummy refers to the dummy variables for Sub Saharan Africa, North Africa, Latin America , East Asia and South Asia.
[e] Indicates exceeds Stock and Yogo (2005) critical values for bias reduction to no more than 20% of the OLS estimates and exceeds the critical
value for 25% maximal IV size distortion. [f] Indicates it does not exceed Stock and Yogo (2005) critical values for both bias reduction and maximal IV size distortion for 30%.

Table 1.3 Two stage Regression of Income Inequality Equation

Variables [a,b]	Coefficients
Growth (1985-90 Average)[c]	-2.72
	(-1.65)
Gini (1965-1985 Average)	0.45
	(2.21)
Urbanization Rate (1965-1985 Average)	-0.24
	(-1.24)
% Aid -GDP (1965-1985 Average)	-0.41
	(-1.79)
% Language Fraction	12.97
	(1.73)
% Ethnic Fraction	-0.27
	(-2.13)
Centered R-Square	0.64
N	56.00
Sargan statistic (over-identification test of all instruments):[C]	4.54
Weak Instrument. Wald F	2.96 [d]

[a] The dependent variable is income inequality (1985-1990 average)
[b] The values in parenthesis are t-statistics.
[c] In this Two Stage Least Square Estimation growth is instrumented by distance of the nearest navigable river or seacoast from the centroid of the country. The p-value for the over-identification test is 0.11.
[d.] Indicates it does not exceed Stock and Yogo (2005) critical values for both bias reduction and maximal IV size distortion for 30% .

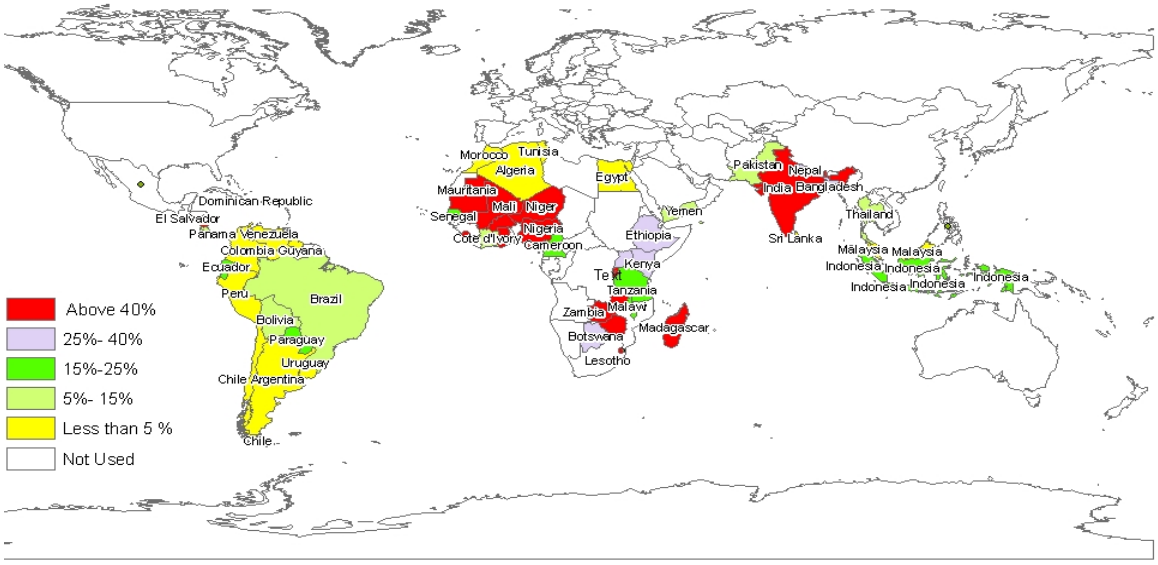
Table 1.4 Poverty Regression: Global and Geographic Weighted Regression Parameter Summary

Variable	Minimum	Lower Quartile	Median	Global (OLS)	Upper Quartile	Maximum
Lagged Poverty (1965-85 Average)	-0.30	0.48	0.70	0.42†††	0.88	1.22
Growth (1985-90 Average)[a, **	-1.62	-0.13	-0.09	-0.09††	-0.04	0.11
Gini (1985-1990 Average)[a, ***	-0.22	-0.02	0.001	0.01††	0.06	0.12
Primary Education Enrolment Rate (1965-1985 Average) ***	-13.79	-1.13	0.06	-0.33	2.07	9.59
Secondary Education Enrolment Rate (1965-1985 Average)	-7.97	-5.96	0.49	-2.47††	3.05	6.70
Higher Education Enrolment Rate (1965-1985 Average)	-7.04	2.07	8.29	7.48	8.80	16.32
% Aid -GDP (1965-1985 Average)	-5.50	-1.14	-0.37	0.97	0.79	3.02
Dependency Ratio (1965-1985 Average)	-2.93	-2.51	0.42	-1.21†††	0.92	1.21
Urbanization Rate (1965-1985 Average)	-0.06	-0.02	-0.02	-0.02†††	-0.02	0.08
% Land Tropics	-1.51	-0.69	0.37	-0.06	1.88	3.31
No. of observations			56	56		
Adjusted R2			0.85	0.74		
F-stat of GWR improvement over OLS			4.05†††	n.a		

[a] The Variables growth and gini (1985-1990) in this poverty regression are the predicted values from the two stage least square growth and inequality regression respectively. Note that ***, **, or * on variables indicate significant spatial variations in GWR coefficients of these variables at 1%, 5%, or 10% levels respectively, as determined by the Monte Carlo test described in Fotheringham et al. (2002) and Charlton et al. (2003). A †††, ††, or † indicate that the parameter is significantly different from zero at 1%, 5%, or 10% levels respectively.

Figures

Figure 1. The Geographic Distribution of Poverty Across Developing Countries
(Percentage of Population Living Below a $1 a Day Poverty Line)



Note: The Data for poverty rate is 1985 -1990 Average

Figure 2. The Geographic Variation in the Lagged Poverty Rate

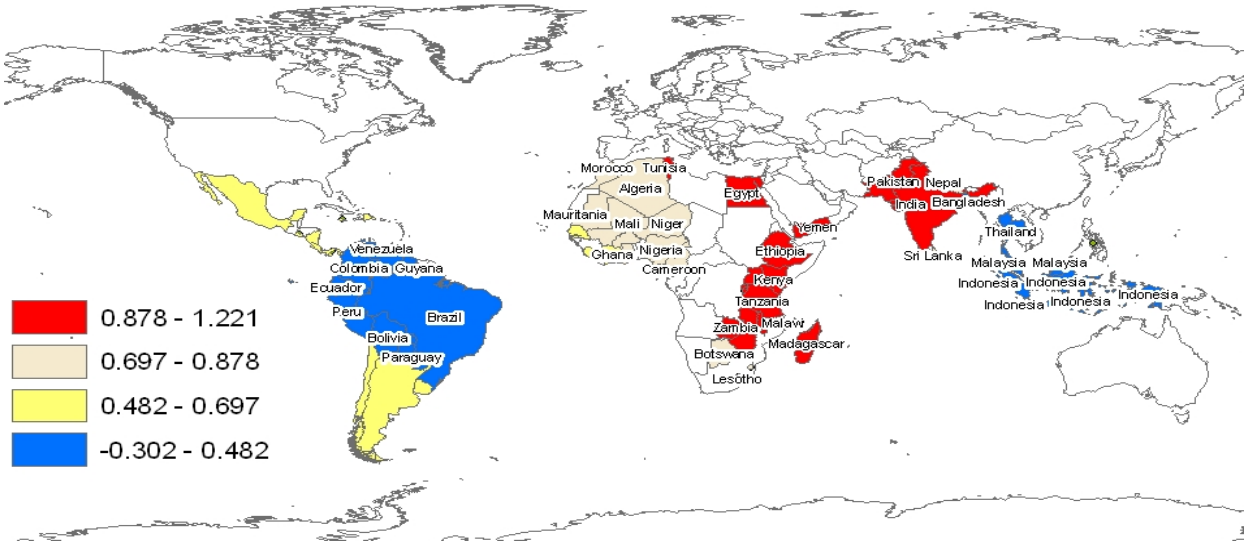


Figure 3. The Geographic Variation in the Coefficient of Primary Enrolement Rate

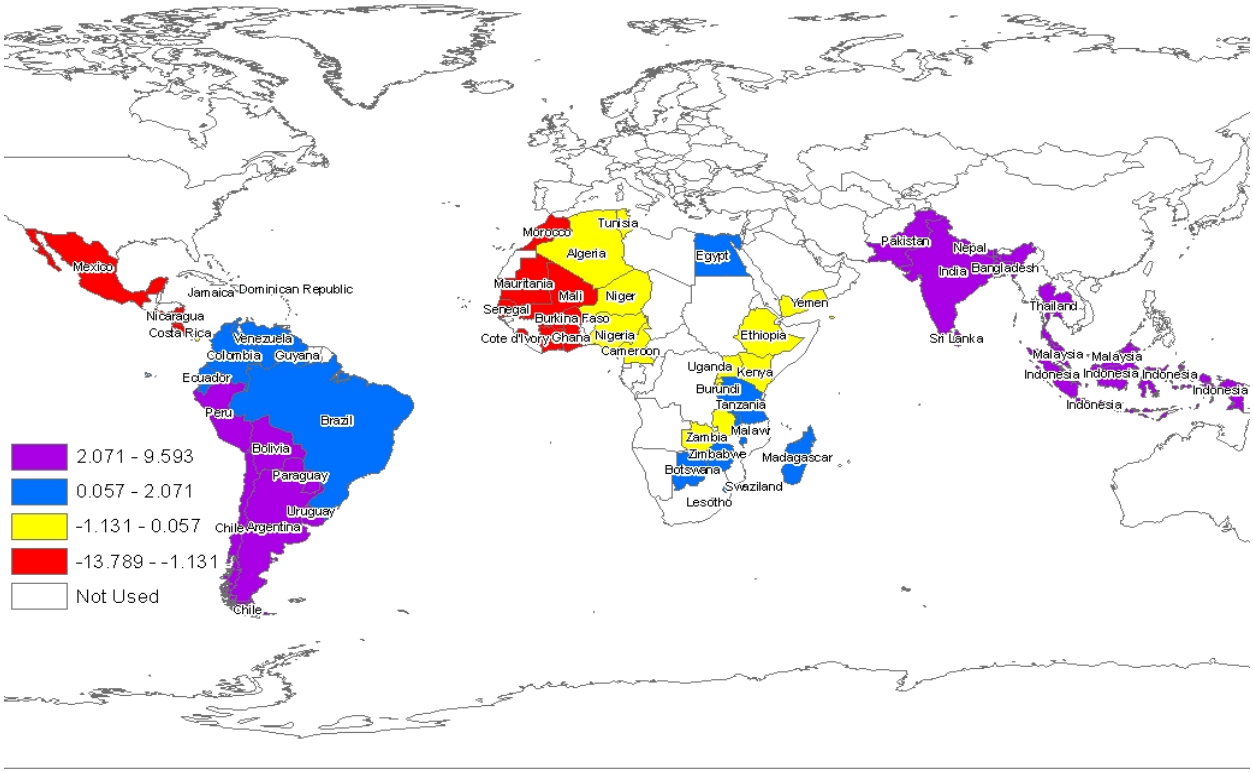


Figure 4. The Geographic Variation in the Coefficient of Urbanization Rate

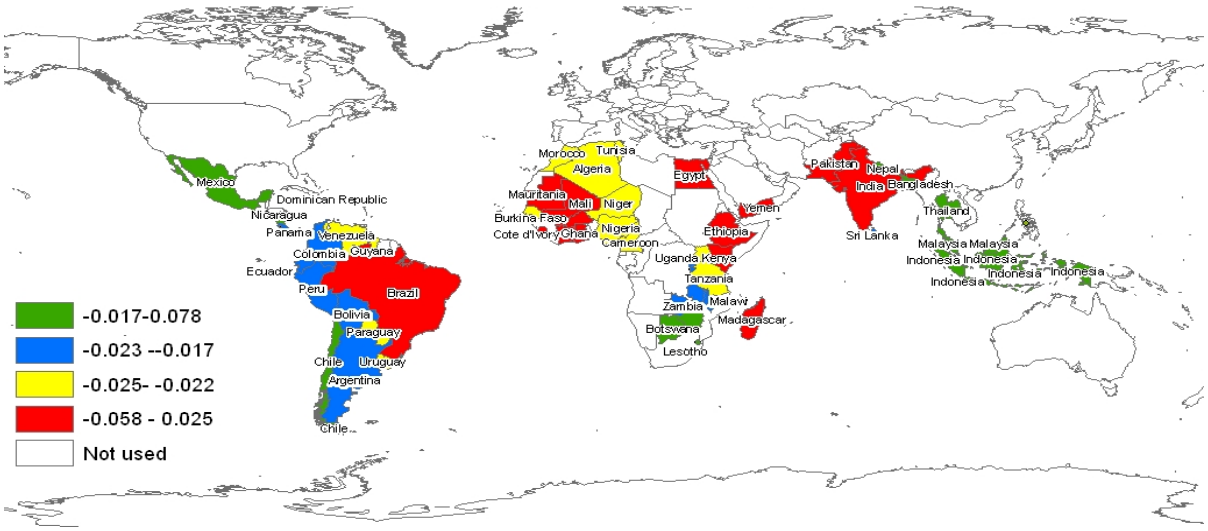


Figure 5. The Geographic Variation in the Coefficient of Aid

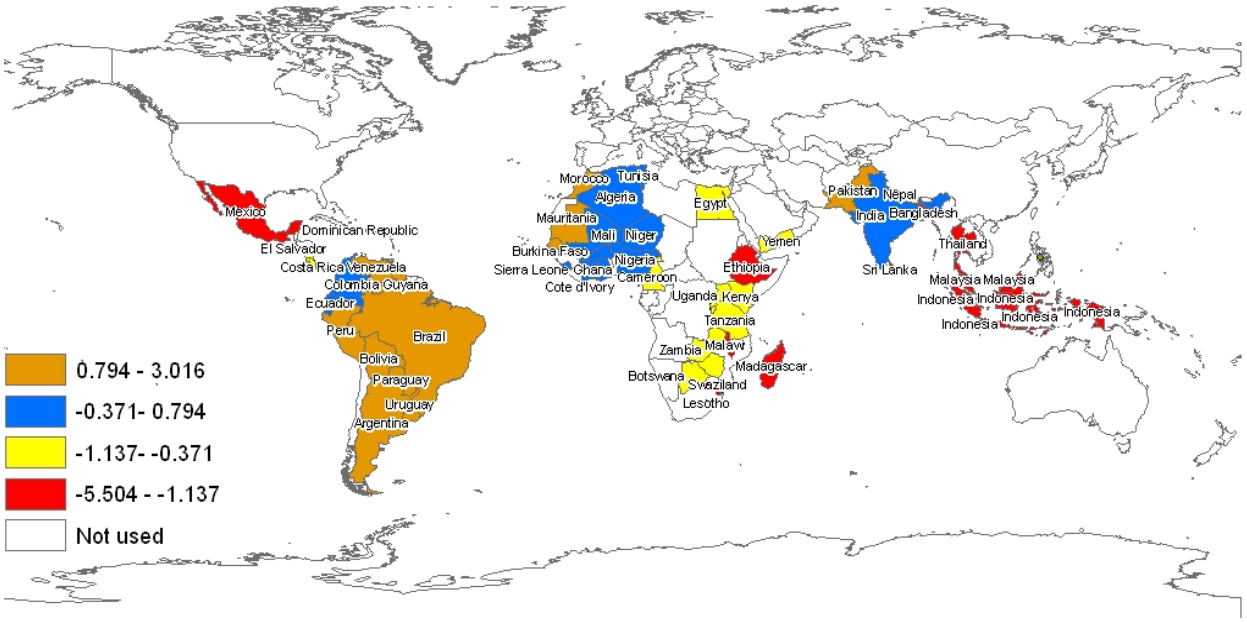


Figure 6. The Geographic Variation in the Coefficient of Growth

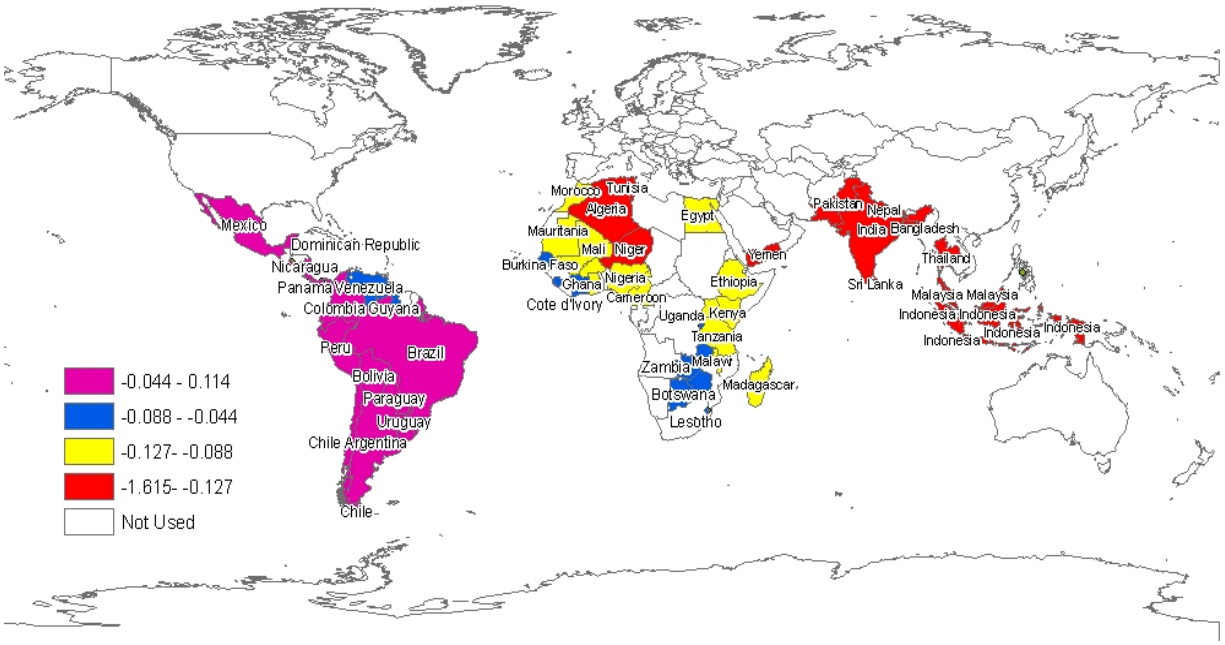
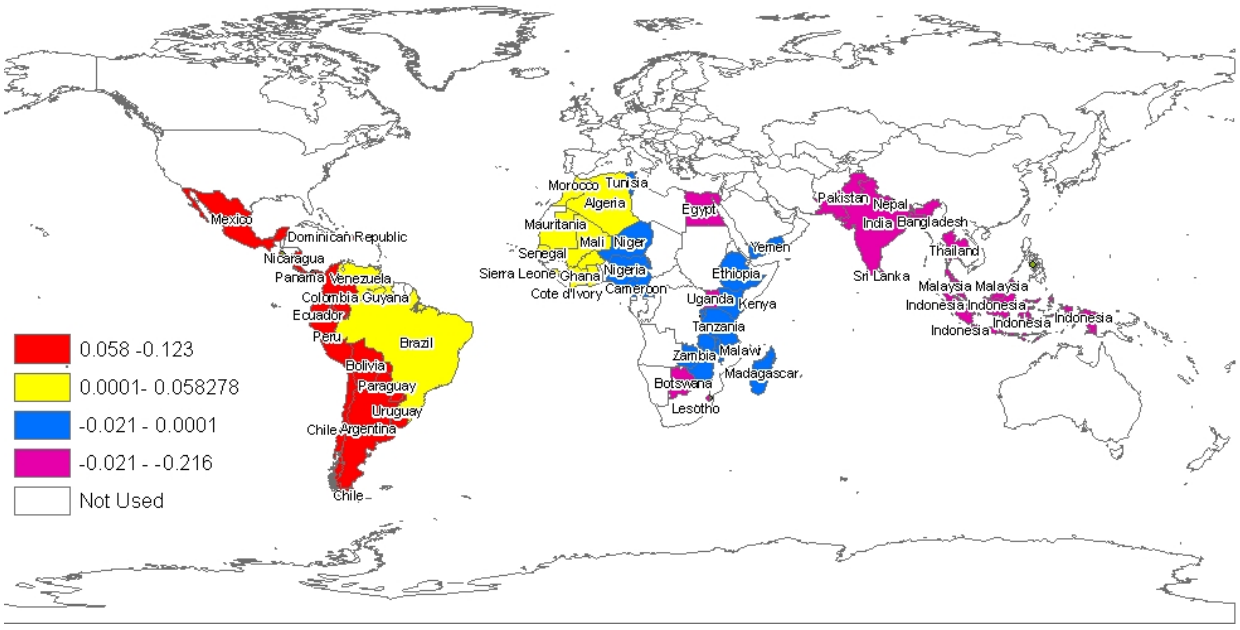


Figure 7. The Geographic Variation in the Coefficient of Income Inequality



Essay 2: Poverty Incidence and Intensity: Variation across Canadian Communities

2.0 Introduction

Accurate and informative measurement of poverty is essential to policy makers concerned with welfare of society at a national or regional level. The issue of measurement of poverty also includes the geographic distribution of the poor. Therefore, poverty measurement techniques for the purpose of making comparisons over time or across communities warrant special attention for academic and policy reasons. Poverty measurement is a crucial intermediate step in public policy making and in designating effective anti-poverty policies. A robust poverty measure is required to portray the extent, trend and distribution of poverty (Xu and Osberg, 2000; Triest, 1998). Hence, in light of poverty measurement issues, this paper tries to empirically link regional poverty variation in Canada using different measurements.

The most widely used poverty measure in developing and developed countries is the Headcount Ratio, the percentage of people below the poverty line.[1] The Headcount Ratio, however, is a crude measure as it fails to account for the depth of deprivation among the poor (Sen, 1976). In Canada the most extensively used poverty measure by activists, reporters and academic researchers is Statistics Canada's Low Income Cut-Off (LICO) (e.g. Chokie and Partridge, 2008 ; Osberg and Xu,1999; Picot et al., 2004; Campaign, 2000 etc.). According to Statistics Canada, LICO rates are income thresholds below which a family will likely devote a larger share of its income to the necessities of food, shelter and clothing than the average family.[2] Webber (1998) notes that when LICO was first introduced, the average household spent 50% of its pre-tax income on food, shelter and clothing then twenty percentage points were added to this figure, on the rationale that a family spending over 70% of its income on essentials could be regarded as being in "straitened circumstance. LICO rates are adjusted for differences in cost of living in different communities.

[1] Poverty line, the level of income below which a household is defined as poor, is usually an absolute measure when used in the context of developing countries (e.g. a dollar a day poverty line). In the case of developed countries such as Canada, the poverty line is highly subjective and intended to convey households' relative income deprivation.

[2] In addition to LICO, in Canada there are also other measures of low-income that have been proposed by Statistics Canada and Human Resource Development Canada. Statistics Canada in 1991 proposed the Low Income Measures (LIMs) which is defined as half the median family income (income is adjusted for the family size) as a cut-off line. Another measure is the Market Basket Measure which estimates the cost of a specific basket of goods and services and households with income levels lower than the cost of this basket of goods are classified as low-income. Nonetheless, LICO still remains to be the most commonly used measure for statistical analysis.

Those falling below LICO represent economically challenged households. Yet, using LICO as a poverty line has various disadvantages as it is a relative measure linked to average living standards through its connection to average consumption of a given basket of commodities that varies over time through the process of occasional rebasing (Sarlo, 2001). For example, changes in standards of living will make LICO an inappropriate poverty line for analysts or policy wonks who want an absolute or fixed poverty threshold. It also fails to account for the degree of deprivation among households with income below the cut-off level. In this regard, several studies in Canada have opted for different types of poverty measurements (e.g. Pendakur 2000, Osberg and Xu 1999; 2000). [3]

Another commonly used measure is the so-called Poverty Gap. This index measures the aggregate shortfall of the income of all households living below any given poverty line. The advantage of using the poverty gap as an index for poverty is that it goes beyond identifying the poor by measuring the intensity of their poverty (Kakwani, 1993). Therefore, using a poverty gap (poverty intensity) instead of headcount rates (poverty incidence) could be more helpful in formulating adequate programs that can effectively combat poverty.

In the Canadian context, the poverty gap may be measured by any of the alternative cutoffs (see footnote 2). This study utilizes the LICO measure because of data availability at a community level. The size of the LICO gap (poverty gap) may be calculated for economic families below LICO, i.e., the size of the difference in observed household incomes and the LICO. Thus, for a community, this will be the aggregate number of dollars that would be needed to be generated by economic families under LICO to raise their incomes to the LICO level. The number of economic families below LICO in a community and their average income from all sources is known, so this enables one to calculate the size of the gap per economic family (see equation 1 below). [4]

$$family\_LICO\_GAP_{i,p} = \frac{aggregate\_CCS\_LICO\_GAP}{number\_econ\_families\_below\_LICO} \qquad (1)$$

where, the numerator- *aggregate_CCS_LICO_GAP*, measures the aggregate income needed to bring economic families below LICO up to LICO and the denominator measures the total number of individuals who live in economic families below LICO.

[3] Pendakur (2000) estimates the poverty rate as the proportion of individuals who live in families with consumption—rather than income—lower than an absolute poverty line. The absolute poverty line used in his paper is based on the expenditure necessary to achieve a minimum level of material well-being. It is an absolute poverty study of individuals classified at the family level. One advantage of using expenditure data is that short-term fluctuations in income are avoided as a household would be expected to have an expenditure pattern consistent with its long-run expected income.

[4] According to Statistics Canada an Economic Family is defined as a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law or adoption.

Interestingly, two communities with the same share of their population below the poverty line (LICO) can have very different depths of poverty. Thus, the determinants of poverty incidence may differ from the determinants or characteristics associated with the depth of poverty in a given locality. Analogously, the per capita poverty gap is calculated by dividing the aggregate community LICO gap by the total number of individuals living in poor households (see equation 2 below).[5]

$$per\_capia\_LICO\_GAP = \frac{aggregate\_CCS\_LICO\_GAP}{number\_persons\_below\_LICO} \quad (2)$$

A simple comparison of the above two measures shows that two CCSs with the same family LICO gap level may exhibit different poverty intensity levels. That is, if the number of individuals who live in these poor economic families is greater in one of the CCSs, then the intensity of poverty or gap per capita is higher in the CCS with fewer numbers of persons, which suggests a more severe poverty. Moreover, if considered from the poverty incidence point of view, this CCS will be considered a "lower" poverty area, which could be misleading.

In light of these different measurements of poverty, this paper is centered in empirically examining the regional variation of poverty across communities in Canada. Each measurement of poverty captures a particular or specific aspect of poverty. For example, poverty rate (incidence) ignores the depth of poverty and poverty gap indicator ignores the number of poor people. Thus, these measurements point to different objectives of policy and consequently, they point to different conclusions and policy implications (Osberg and Xu, 2000).

Consequentially, to fill the information gap that might arise from the use of one-dimensional poverty measure and for comparison purposes, I use three LICO based measures in exploring regional variation in local poverty. First is the LICO gap per poor economic family. The second is per capita LICO gap and the third measure is the local head count poverty incidence rates (% of individuals living in families with total income less than the LICO). The analysis of these three measures of poverty in a place-based approach makes this paper unique compared to the Canadian poverty study literature which usually emphasizes individuals or households as observations of study as opposed to using each community across Canada as an observation. Unlike the previous Canadian poverty studies, this study addresses the variation in both poverty incidence and depth and

[5] The total number of poor individuals is derived from the number of total individuals who belong to a poor economic family.

does so for virtually all regions in the country. If the focus of policy is to change the behaviour of individuals (e.g. get training as an economist or move to jobs for ditch diggers), then a community / regional focus is helpful for targeting the advertising and the offices for individuals who would be in scope to apply for the grant. If the focus of policy is to change the characteristics of the place (e.g. rip up the pavement into and out of town so that local residents will have a non-tariff barrier that raises their cost of leaving and raises the costs of entering), then a focus on community characteristics and items amenable to policy (e.g. removing pavement) may be discussed as options.

Basically, this study is an extension of the study by Chokie and Partridge (2008) --that investigates the determinants of low-income rates (poverty incidence) for over 2,400 Canadian communities over the 1981-2001. To extend their work, in this study, the poverty gap of households is calculated and then divided by the total population living in poor households to derive a per capita poverty gap to investigate the dynamics of poverty intensity across these communities in relation to additional variables such as the proportion of female lone parent families. This makes this study a more comprehensive empirical analysis of local poverty as it takes into account alternative measures of poverty and it assesses whether community / regional characteristics are related to the poverty rate in communities / regions with a view of assessing whether any community / regional policy levers may be available to reduce the prevalence of poverty in target communities.

This paper has three important findings. By exploring the medium-to-short term determinants of family poverty-gap, per capita gap and poverty incidence rates across urban and rural Canada, I find that both the poverty gap and incidence levels are determined by demographic trends and labor market conditions—with labor market or economic conditions having a greater impact. However, strong labour market conditions have a greater impact on the poverty gap than poverty incidence levels. On the other hand, the per capita poverty gap level is highly associated with local demographic composition. Second, among the potentially high-poverty demographic groups, higher shares of recent international immigrants and lone female parent families contribute to higher local poverty gap levels. However, aboriginal concentration seems to matter only in high-poverty communities. Finally, regional analysis of poverty using different measurements leads to different conclusions and policy implications.

The paper is organized as follows. The next section (2) presents the contextual link between poverty gap and incidence rates and their core determinants. Section 3 discusses the empirical implementation, econometric estimation techniques and data. The fourth section provides the regression results and finally the fifth section concludes with summary and policy implications.

2.1 Poverty Incidence and Intensity: Context

Geographical variation in the economic and demographic characteristics of communities or regions is crucial in explaining variations in regional economic outcomes such as poverty. For example, Blank (2005) and Levernier et al. (2000) underscore the importance of a particular locality, its natural environment, economic structure, public and community institutions; its existing social and cultural environment; and the demographic characteristics of its population in shaping the level of poverty of the area.

However, studies that empirically explore the geographical variation of local poverty intensity levels across Canadian communities are scant. Most of the poverty studies are at individual or micro level studies or at aggregate sub-national level (Osberg and Xu, 1999; Osberg, 2000; Vera-Toscana et al., 2001). At a provincial level, Osberg (2000) examines provincial poverty intensity demonstrating how even at the provincial level, there is significant heterogeneity.[6] Although Osberg's analysis illustrates the potential payoff from examining sub-national Canadian poverty, it also illustrates the need to examine the role of local labor markets and demographic conditions on community poverty intensity.

One of the key advantages of a local poverty study is that it helps curtail the problem of aggregation which might cloud the possibility of formulating effective social or economic policies. Micro level studies which do not include independent variables to measure the degree of rurality (density and distance to density) might give an incomplete picture of the role of poverty-reducing policies in rural versus urban or high versus low poverty areas.

Also, the correlation between local economic or demographic features and the associated local poverty levels might not be the same depending on which measurement of deprivation is used. Some measures of poverty might be highly correlated with demographic structure of the community; while other measures might have high association with local economic features. In what follows, I explore the contextual link between community poverty incidence and intensity along with the core geographic, economic and demographic factors.

[6] Osberg and Xu, (1999, 2000) analyze the statistical significance of poverty intensity differentials across Canadian provinces. They measure the overall percentage rate of change in poverty intensity over time as the sum of the percentage changes in the poverty rate, average poverty gap ratio (among the poor), and Gini index of inequality in the poverty gap ratios (among all people). The interaction of the poverty rate, gap and gini among the poor meets a desirable criterion for a good poverty measure; however, their study is limited to assessing the statistical difference between the levels of intensity with-in provinces. They do not explain the core factors behind the differences among poverty rates and gap across provinces.

The general relationship between poverty incidence and poverty gap is direct. Intuitively, communities with relatively higher rates of poverty incidence will need to spend more resources in lifting the poor out of poverty. However, this is not necessarily the case. If, for example, one half of the households have a level of income near the poverty line, then a small transfer to these households would reduce the prevalence of poverty by 50%. Thus, this link is not as direct as it seems. The depth of poverty for economic families in communities with a relatively low incidence might be greater than in those communities with a higher poverty rate; in the latter the aggregate short fall of income required to pull the poor out poverty may be relatively smaller.

In this regard, Statistics Canada census data indicates that the average family poverty gap rose from $8,376 in 1991 to $8,742 in 1996 as a result of a sluggish economy and government budget cuts. That is, the average poor family fell $8,742 below the LICO cutoff in 1996, or 31% below the average LICO cutoff.[7] Strong economic growth reduced the gap to $8,577 in 2001. Interestingly, unlike the incidence of poverty which is higher in rural areas compared to urban Canada, the aggregate sum of money needed to lift economic families out of poverty is lower in rural Canada. For example, in the year 2001 the average family poverty gap level is $9,415 in urban Canada compared to $8,313 in rural Canada. In the same year, the average per capita poverty gap is round $1,913 in rural Canada and $2,197 in urban Canada. All the dollar values for the average family poverty gap levels are expressed in terms of year 2000 constant dollar values and are not weighted population.[8,9]

Due to differences in economic and demographic settings in urban and rural areas, poverty incidence and intensity may follow a different dynamic. Rural areas generally have a higher incidence of poverty. In rural communities, the labor market is generally thin with employment opportunities being minimum wage paying and part time offerings with limited job security (Gibbs, 2001; McKernan et al., 2001). Job accessibility is also further hampered because of limitation to mobility due to high commuting distance and limited public transportation (Brown and Stommes, 2004; Davis et al., 2003). Partridge and Rickman (2007), for example, note that the reason for the higher incidence of poverty in rural areas of the U.S. is that, in spite of the relatively lower cost of living, the heavy proportion of the rural workforce in the low-wage agriculture or primary sectors raises the rural poverty rate.

[7] According to Statistics Canada, depending on family size and community size, LICOs for 1996 ranged from $11,839 to $43,634 before tax.

[8] The incidence of poverty in urban Canada in 2001 is around 12% compared to 14% is rural Canada.

[9] Statistics Canada data shows that the average family size of a rural household with income below LICO is greater than a poor urban household.

Nonetheless, though the rates of poverty in rural Canada are higher (according to the calculation of this paper) than in urban Canada, the depth of poverty per low-income rural Canadian is less than that of their urban counterparts. The most interesting question is why rural areas exhibit a significantly lower family and per capita poverty gap despite the higher incidence of poverty. This special phenomenon might also raise many questions regarding the demographic composition of low-income Canadians across urban and rural communities. The differences in terms of cost of living, family structure, ethnicity, place-of-birth-origin and immigration may explain the difference. Further, this could also be attributed to the higher rate of lone-female and male headed households in urban areas, as well as the higher rate of recent international immigrants.

Community demographic structure is linked with local poverty level. For instance, aboriginal Canadians, single parents, and recent immigrants make up a higher proportion of the Canadian poor (Stokes et al., 2004; Statistics Canada, 2003, Heisz and McLeod, 2004). This makes local demographic composition particularly important in understanding the depth and incidence of poverty across communities. Family structure is highly correlated with poverty and changes in family structure over time have contributed to changes in the poverty rate (Finnie and Sweetman, 2003; Fisher, 2007). Hence, policies that target poverty reduction should include a careful assessment of the demographics of the poor.

The case of lone-female parent families is particularly pertinent as this group has been associated with higher local poverty (Partridge and Rickman, 2005; Levernier et al., 1998; Blank and Hanraty, 2001). The persistence of poverty is a typical attribute of lone-female parent families (Finnie and Sweetman, 2003). For example, between 1991 and 2001 the number of female headed households in Canada rose by 18%. In urban Canada the increase is even higher (21%). In this respect, the greatest burden or cost of persistent poverty is its inter-generational nature. Children who grow up in a poor lone-female parent household are more likely to be poor in their adult life (Karolyn et al., 1998; Carneiro and Heckman, 2003; Case et al., 2003).

There is substantial evidence that poor households are less mobile because mobility requires an immediate expenditure in anticipation of an increased flow of revenue in the future (Partridge and Rickman, 2008a). Market-failure in the market for loans to finance this investment for poor households causes the lower rate of mobility. Households with lower levels of education and skills, who are typically least likely to be employed, have been observed to be less geographically mobile (Yankow, 2003). That is, in a neoclassical view, which assumes perfect capital markets so that individuals can borrow to make the move and perfect information so that job at the destination is a certainty, then poverty would be self-correcting through economic agents responding to better

opportunities in their community or through mobility to regions where there is a higher level of wages and better economic prospects. The case of higher proportion of recent immigrants in urban areas with relatively near proximity to jobs which are within a commuting distance of urban core is a good example of limited mobility.

Thus, one research objective is to examine how best to achieve a lower local poverty gap or incidence if the demographic characteristics are the *problem by* focusing on the geographic areas where poverty is persistent. One option is to help places where there are concentrations of poor residents, by using "place-based" policies. However, place-based policies such as supporting employment growth may have only short run effects or very limited effect, i.e., the creation of new jobs may not endure in the long run (Partridge and Rickman, 2005; Chokie and Partridge, 2008). This is particularly the case, when there is an in-commuter response to the newly created jobs (Levernier et al., 2000). In the case of rural areas, on the other hand, place based-policies could be more effective as information may be informally disseminated among the locals but not to individuals outside the regions because of lower population density and a lower probability of in-commuters may leave the newly created jobs available mainly to local residents (Partridge and Rickman, 2008b).

While local poverty incidence and intensity studies are complementary to each other, analysis of poverty intensity goes a step forward by indicating both the rate as well as the depth of poverty. For example, even if employment growth in a given locality reduces the incidence of poverty, the depth of the income gap – is this the aggregate gap or average gap may not change. Put differently, the reduction in the rates of poverty might be accompanied by an increase in the size of poverty gap level of those who still remain to be "poor". Hence, examinations of poverty intensity and rates might paint very different pictures. Therefore, examining the depth of poverty is more appropriate in understanding the persistence of poverty across communities with higher shares of demographic groups that exhibit longer poverty spells. This is a very important contribution because, if poverty rate is used as a yard stick to measure the effectiveness of anti-poverty policy, policymakers may be tempted by 'cream-skimming', because the most cost effective way to reduce poverty is to give a small transfer to the *richest* of the poor (Osberg and Xu, 2006). Therefore, to address this issue, two measures are analyzed separately:

1. the prevalence of poverty in the community (i.e. the percent of individuals living in poor households); and

2. the average poverty gap in the community (i.e. the revenue required to raise all poor households above the poverty threshold, sometimes calculated on a per household basis and sometimes calculated on the basis of per person living in poor households.

The inclusion of the two measures of poverty gap – per capita level and family-gap level is important as the per capita measure brings the issue of economies of size and family size into the analysis. In other words, it highlights the severity or intensity of poverty. In what follows, the empirical examination of different measures of local poverty in relation to community attributes across regions in Canada is presented.

2.2 Empirical Implementation

The empirical model in this paper examines local poverty gap and poverty rates across communities over the census years from 1981-2001. While Chokie and Partridge (2008) regress the poverty rates (LICO), this paper differs in both orientation, inclusion of some additional independent variables and hypotheses to be tested. Furthermore, the poverty gap is analysed at a household (economic family) and at a per capita level to unravel the differences in the dynamics of poverty gap level among households and within members of these poor families. This is especially important when considering potential policy implications of investigations which are place-based in approach.

The unit of observation in this empirical analysis is the census consolidated subdivisions (CCSs) [10] in the10 Canadian provinces. In analysing community poverty gap or incidence, using CCS level data best suits the purpose of this research. Using a CCS as a unit of observation is superior to other alternative units that are available with Canadian data. CCSs are relatively stable geographic units because they have infrequent boundary changes and therefore are appropriate for regional analysis. CCSs also represent a good compromise of a functional region that largely reflects local economic and social conditions of its residents (Chokie and Partridge, 2008). To highlight the

[10] The specific geographic groupings are Consolidated Census Subdivisions (CCS)—which are approximately "communities". A CCS is a grouping of adjacent census subdivisions (usually a rural or urban municipality), which forms more cohesive regions both geographically and economically. Generally smaller, more urban census subdivisions (towns, villages, etc.) are combined with the surrounding more rural census subdivision to create a geographic level between the census subdivision and larger census division (du Plessis et al., 2002). The general rules for constructing CCS are the following as taken from the Statistics Canada website (http://geodepot.statcan.ca/Diss2006/Reference/COGG/ShortDescription_e.jsp?REFCODE=10&GEO_LEVEL=20&TYPE=L):

a. A census subdivision (CSD) with a land area greater than 25 square kms can form a CCS of its own. CSDs having a land area smaller than 25 square kms are usually grouped with a larger CSD.
b. A CSD with a land area greater than 25 square kms and surrounded on more than half its perimeter by another CSD is usually included as part of the CCS formed by the surrounding CSD.
c. A CSD with a population greater than 100,000 according to the last census usually forms a CCS on its own.
d. The CCS's name usually coincides with its largest CSD component in terms of land area.

geographical differences of communities (CCSs) in terms of agglomeration, commuting or migration which moderates both the incidence and intensity of poverty effects, I also examine "urban" and "rural" subsamples. The urban set comprises CCSs with at least one component CSD located in Census Agglomerations (CAs) and Census Metropolitan Areas (CMAs), with rural CCSs having no CSDs falling within CAs and CMAs. [11]

The dependent variable in this paper, *poverty*, is examined using three different measures. The first measure is the family poverty gap. This measure is obtained by dividing the aggregate short fall of income (aggregate LICO-gap) by the number of poor households in the community. The Second measure is poverty-gap per capita. Poverty gap per capita is obtained by dividing the aggregate poverty gap level by the total number of individuals who belong to the poor families, i.e. the aggregate poverty-gap per person.[12] Finally, a crude measure of poverty rate (LICO rate) is considered.[13] These three measures of poverty are empirically analysed using a panel fixed effects model shown by equation (1) below. The panel fixed model will be estimated by pooling the census data for 1981, 1986, 1991, 1996 and 2001 for CCS *i* located in province *p*. In what follows, I discuss equation (1) and the explanatory variables that enter into the equation.

$$\text{Poverty}_{ip,\,t} = X_{ip,t}\,\beta + \sigma_{ip} + \tau_t + \varepsilon_{ip,t}, \qquad (3)$$

where X denotes the time variant explanatory vector of economic (ECON) and demographic (DEMOG) factors described below, σ_{ip} denotes the CCS fixed effects, and τ_t is a time dummy (1981 is the omitted period).

The fixed effect estimation accounts for time invariant explanatory variables and idiosyncratic location-specific features that are peculiar to a specific CCS. For example, issues related to geography, say (distance from CA / CMA). The time dummies account for national policy changes, business cycles, and demographic trends that have common impacts across the country.

The vector of economic factors ECON includes 1981- 2001 local employment /population ratio and unemployment rate by gender for the prime age labor force by *place of residence* (25-54 years

[11]CAs and CMAs are defined as consisting of one or more adjacent municipalities surrounding a major urban core. The population required for an urban core to form a CMA is at least 100,000 and at least 10,000 for a CA. To be included in a CA or CMA, adjacent municipalities must be highly integrated with the central urban area, as measured by commuting flows (Heisz and McLeod, 2004). The remaining CCSs are rural and small town.

[12] LICOs are only adjusted for family size not family composition. However, economies of scale inherent in the difference in the number of individuals that belong to poor economic families and the size of LICO gap is reflected in the aggregate poverty gap per person.

[13] Family and per capita poverty gap measures enter in the regression after logarithmic transformation (i.e. the log of the gap is estimated as a function of the level of the community variables..

old).[14] The male and female employment/ population rates are expected to have a negative association with the level of poverty. The ECON vector also includes six CCS industry employment shares; and the nonfarm self-employment rate by gender. Local industry shares reflect the regional differences in economic activity specialization which shields or exposes communities to any unforeseen business cycle fluctuations; differences in specialization also affect the number and quality of job opportunities (Blank, 2005).

The DEMOG vector includes factors that describe the local demographic structure. These factors contain the age composition of the community which are the components of the dependency ratio. Communities with higher percentage of children below the age of 15 are expected to have a positive association with poverty. The concentration of poverty prone demographic groups such as the percentage share of lone-female parent households, aboriginals and recent international immigrants are included in this vector. The inclusion of these variables is central as it helps examine if the positive association of poverty with these vulnerable groups still remains even after controlling for other variables correlated with high-known poverty groups (Picot et al., 2003). [15]

Another key difference between this study and previous Canadian poverty studies is that it assesses the impact of *within-community* time-series variation in labour market or demographic conditions across the different measures of poverty. For instance, the response of headcount rates to local or regional job growth may give an incomplete picture of how strong economic conditions affect poverty because the incidence may not decline unless the employment rates of at-risk local residents increase (Levernier et al., 2000; Chokie and Partridge, 2008). Therefore, analysis using more than one measure of poverty will provide a more reliable and complete conclusion.

Educational attainment shares are also included to control for human capital differences (where the share of population below grade 9 is the omitted category). Poverty depth is expected to be lower for CCSs with a higher level of education attainment. This is because human capital is associated with higher labor-force participation and higher wages and it affects the level of income inequality and poverty (Sarlo, 1996).

Other social variables highly associated with the issue of immigration, integration and human capital are also included in DEMOG. These include the population shares by place-of-birth origin

[14] Both employment and unemployment rates are included because these values were calculated from place-of residence data not place-of-work data. The coefficients of employment rate then can be interpreted as the effect of employment given unemployment rate constant and *vise versa*.

[15] Immigrants who were in Canada for more than 5 years are only included in as sensitivity analysis. This is because international immigrants are expected to have a greater scope for integration as they reside in the country for more than 5 years.

(e.g. North America and Western Europe, Latin America, Africa, Asian, in which Oceania origin is the omitted category). In addition, language variables such the share of population whose mother tongue is only English, only French, both English and French or Neither is also added (share of population whose mother tongue neither English nor French is the omitted category).

To capture the effect of regional labor market tightness (strength) and employment accessibility, I include the size in population within 100kms of the CCS (one-hour commuting radius) and population base between 100-200kms of the CCS. These variables are more pertinent to rural communities where the commuting distance is relatively greater. CCS-own population density is also accounted for because it is expected that low population density is associated with increased information cost and impedes skill matching in the labor market (Partridge and Rickman, 2005).

To correct the problem of potential cross-sectional correlation in the residuals or spatial autocorrelation, the regressions are performed by assuming that regressions in those CCS residuals are correlated or clustered within a given Census Division (CD), but uncorrelated across CDs, which adjusts the t-statistics in a manner similar to the White correction for heteroscedasticity.[16,17] This approach of correcting for potential autocorrelation of residuals using clustering of CCSs within a CD does not impose restrictions on the residuals within a cluster. That is, contrary to the other spatial econometrics correction methods where several assumptions are employed on formulating the degree and extent of the potential across CCS correlations of residuals based on distance or contiguity.

2.2.1 Descriptive Statistics

Figure 8 shows the geographic variation of 2001 community poverty gaps across communities in Canada based on 1996 census boundaries. It depicts the distribution of low, average and extremely high family poverty gap. Communities or regions that require less than $5,000 per poor economic family to raise their incomes to the LICO level are considered low intensity communities, communities which require $5,000 to $10,000 as medium and communities with a need for more than $10,000 per poor economic family are labelled as high-poverty gap communities. [18]

[16] Statistics Canada defines a CD as a provincially legislated area (such as counties, *municipalité régionale de comté,* and regional districts) or their equivalents. CDs are generally constructed to reflect functional economic regions. There are 288 CDs using 1996 boundaries.

[17] The corresponding robust t-statistics are calculated using the STATA econometric software Cluster option.

[18] The criteria used in classifying high, medium and low poverty gap level is based on the mean and standard deviation of poverty gap level across all communities.

The geographic distribution shows no spatial pattern in the geographical dispersion of the poverty gap level in either Western or Eastern Canada. However, in Saskatchewan it shows the prevalence of communities with low intensity of poverty lying next to high intensity communities compared to the other provinces where there are fewer communities with poverty gap less than $5,000 per family. Particularly, in exurban Calgary and Edmonton where the percentage of the poor is relatively low, the poverty gap seems to be large. Finally, Figure 8 shows that there are a greater number of communities with medium poverty gap throughout the country.

Figure 9 shows the geographic variation of 2001 community LICO (poverty) rates for the ten Canadian provinces (based on 1996 census boundaries). It depicts the distribution of low, average and extreme poverty rates. In Comparison to Figure 1, generally there is no clear one-to-one correspondence between the poverty rate and the extent of the poverty gap across Canada. For example, in eastern Canada, around Toronto, Windsor, Ottawa and Montréal communities exhibit low poverty rates but high or medium poverty gaps.

Table 2.1, presents the weighted and un-weighted descriptive statistics for the pooled census data of 1981, 1986 1991, 1996 and 2001 together. Of the potential 2,607 CCSs or "communities" using 1996 boundaries, over 200 observations were omitted per census year for which Statistics Canada did not report all of the data, which includes all CCSs with fewer than 250 people and CCSs with no reported income due to Statistics Canada's data suppression. In addition, communities with reported poverty rates but missing poverty gap data were also dropped. Column 1 shows selected weighted descriptive statistics for the full sample while Column 2 shows un-weighted descriptive statistics of the full sample. These statistics are presented for urban and rural subsamples separately in columns 3 and 4 respectively.

The un-weighted (i.e. per community) average poverty gap per poor economic family in a typical community expressed in 2000 constant dollar value is about $7,907 in the entire sample, compared to the population weighted average which is around $9,819. The weighted descriptive statistics gives more weight to communities with larger population size for a better approximation to the condition of individuals or families. The corresponding weighted poverty gap level is around $8,405 and $10,182 for the rural and urban subsamples respectively.

With respect to the economic variables, except for nonfarm self employment rates, both male and female employment rates are higher in urban CCSs, which could be attributed to the advantage of agglomeration economies including job accessibility. Urban CCSs also have higher average educational attainment levels. The share of female-headed families is higher in urban communities.

Rural CCSs have disproportionately more population with place-of -birth-origin from British Islands, North America or West Europe. The (off-reserve) population share of aboriginal descent is higher in rural areas, while the population weighted percentage of recent immigrants in the urban sample is almost six times that of the rural sample.

2.3 Empirical Results

Unlike cross-sectional or time-series estimation techniques, the fixed effects (FE) model explains within-CCS *changes* in the dependent variable in relation to the *within* CCS changes in the level of explanatory variables. It is a regression of deviations from the mean for both the dependent and independent variables providing parameters that reflect more of a short term association (Partridge, 2005). That is, FE estimation is most likely to reflect a medium/short term linkage between poverty and local economic and demographic factors. One of the key advantages of a FE model is that it controls for covariates that are persistent overtime. Local CCS characteristics that are constant over time but correlated with other explanatory variables might bias the parameter (e.g. in OLS) are omitted. Therefore, all the provincial and remote dummies, distance to CA or CMA are dropped from the regression.

Some of the basic disadvantages of FE estimation include the inability to estimate effects of variables which vary across communities but are persistent over time. FE estimation can also exacerbate biases for data with measurement errors; therefore, the fixed effect models should be interpreted cautiously due to potential measurement error bias that can attenuate their regression coefficients (Griliches and Mairesse, 1995).[19] Nonetheless, as this paper is intended to explain within-CCS changes in the level of poverty (depth and incidence), the FE estimation suits this purpose well.

For the purpose of comparison and understanding the regional variation and dynamics of regional family poverty gaps, individual poverty gaps and the general local poverty rates, regressions are performed for these different measures of poverty. Table 2.2 presents the FE regression results for the family poverty gaps, local poverty rates and per capita poverty gaps across communities along with parsimonious specifications of the family poverty gap regression.

[19] In all the FE regressions the lagged dependent variables are dropped to avoid endogeneity problems; because the lagged dependent variables are correlated with the CCS fixed effect. Including a lagged dependent variable can lead to *dynamic panel model bias* (Greene, 2003). This bias in fixed effects models is due to the correlation of the lagged dependent variable with the disturbances. In this case, using general methods of moments (GMM) with instrumental variables may circumvent problems with correlations of errors. For example, the Arellano and Bond (1991) GMM first-difference estimator can be used to overcome the problem. However, due to a lack of observations per cross-section unit, GMM estimation is not performed.

The sample data for these regressions covers two time spans. The first sample is a full sample that includes all the census years which is obtained by pooling the data from 1981 to 2001. The second set uses data pooled only from 1991 to 2001 to include variables such as the percentage of female headed families data for which are not available in census years of 1981 and 1986. [20]

Table 2.2, Column 1 presents the FE results for the family poverty gap regression; Column 2 presents the FE results for poverty incidence regression and Column 3 presents the results for the per capita poverty gap regression. Columns 4 present the result from a re-estimation of the family gap regression for the urban subsample, whereas, Columns 5 and 6 are re-estimations of the specification in Column 1 by pooling data for only 1991, 1996 and 2001census years. Finally Column 7 presents a parsimonious specification of Column 1 by including only the economic variables.

In discussing the above regressions, I first discuss the estimated coefficients of the economic variables followed by the discussion of estimated coefficients of the demographic variables. Next, I discuss the labor market access variables and finish by discussing the sensitivity analysis results from the parsimonious specifications of the base regression.

2.3.1 Economic Variables

Column 1 presents the outcome from the regression of local family poverty gap on local economic and demographic factors for the period 1981-2001. The results from this regression show that the economic variables have greater significance or impact compared to the demographic variables in shaping the poverty gap level. Both male and female employment/population rates are significant with the expected negative signs. This illustrates that job-creation is likely to have a significant family poverty gap reducing impact in the short/medium term. For example, the elasticity of the family poverty gap to male employment rate is around (- 0.03). A 10 % increase in male employment rate will reduce the local family poverty gap level by 0.3%. Similarly, a ten percent increase in female employment rate will reduce family poverty gap level by 0.2%.[21] Job-creation is most likely to have a higher impact in a medium and short term poverty reduction effort because of the potential longer-term off-setting effects as a result of migration and commuting responses,

[20] The 1991, 1996 and 2001 census pooled data is used for the family poverty gap level regression only.

[21] The impact of female employment growth is generally expected to have a smaller effect compared to male employment growth because female employment incomes are generally lower than males. For example in the year 2000, the average annual pre-tax income of women aged 15 and over from all sources including government transfers was 62% that of men. The earning gap is even worse for lone-female heads of households (43%) (Canada Association of Social Workers, 2004).

where in commuters might minimize the potential gain of less skilled "poor" local residents (Partridge and Rickman, 2005). [22]

The coefficients for the percentage share of nonfarm self-employment rate for both men and women are also negative and significant. This indicates that local entrepreneurship development could be an effective poverty reducing policy. This would be particularly important for lone-female parent households which could have multiple barriers in the labor market because of inaccessibility or low availability of daycare centers and relatively low skill and experience to be highly competitive in the labor market. Therefore, these results provide evidence for the effectiveness of place-based policies which promote local employment growth as an effective tool for poverty gap reduction. However, the effect of job-growth is likely to be effective in communities with limited labor mobility, i.e. where others from surrounding communities do not in-commute take the jobs (Partridge and Rickman, 2008b).

Next, I compare outcomes of the economic variables from the family poverty gap model with the results from the regression of poverty incidence and per capita poverty gap depicted in columns 2 and 3 respectively. The results for poverty incidence regression in Column 2 clearly show that employment/ population rates for both men and women do reduce poverty incidence. This finding suggests that increasing male employment rate by one standard deviation will reduce poverty incidence by 0.12 percentage points. Similarly, increasing female employment rate by one standard deviation is liked to a 0.21 percentage points decrease in poverty incidence. On the other hand, one standard deviation increase in male and female employment rates would reduce the local poverty gap level by 5.1 and 9.4 percentage points respectively. Thus, changes in male and female employment rates do reduce the depth of poverty but has a relatively small impact on the prevalence of poverty.

Particularly important here is whether job creation reduces poverty via increasing the average wage or through lowering unemployment level. Therefore, the job creation impact on poverty incidence may be lower because the depth of poverty changes in income of all families below LICO but few are raised above the threshold. Hence, a decline in the unemployment rate might not lift the income of the poor beyond the LICO level, leaving incidence of poverty unchanged. However, the level of the aggregate poverty gap level might decline.

[22]To check if labor market conditions endure in the long-run in reducing the level of family poverty gap level, I ran a cross-sectional regression (not-reported) by regressing the 1996 or 2001 family LICO-gap level on 1991 values of the explanatory variables. The results show that both female and male employment rates tend to have a smaller impact in the long-run.

In column 3, where the dependent variable is the per capita gap, the coefficients of employment rates for both male and female are still negative. This result is consistent across regressions for the various measures of poverty. However, the negative association between the per capita poverty gap and the employment rate is only statistically significant for female employment rate. In this regression increasing female employment rate by one standard deviation is liked to a 20 percentage point decrease in per capita poverty gap level. Local economic conditions have generally weak significance in the per capita poverty gap model.

Among the three measures of poverty, using family poverty gap or incidence levels in local poverty analysis will most likely draw strong place-based economic development policy as sound anti-poverty policy compared to using per capita poverty gap.

2.3.2 Demographic Variables

After controlling for labor market/economic factors, FE regression results in column 1 show that the share of recent immigrants has a positive association with family LICO gap. This result indicates that, concentrations of potentially vulnerable groups such as recent international immigrants in economically distressed communities have consequences for the family poverty gap. This calls for efforts that facilitate the smooth transition of the newly arriving immigrants in to the labor force and the main stream Canadian culture (Chokie and Partridge, 2008). Nonetheless, the concentration of off-reserve aboriginal Canadians in a given community is negative but insignificant which is contrary to expectation. However, this could be attributed to the welfare and income assistance effects to this particular demographic group.[23] Besides, it is not the variables *per se* but other factors which are correlated with race may be playing a role. For example, community fixed effects for communities with above average share of aboriginal Canadians might be driving the result. In this respect, Armstrong (2001) asserts that within the aboriginal populations in Canada, socioeconomic patterns suggest that location near urban areas or resource-rich areas provide advantages to development, indicating that accessing resources and integrating with urban labor markets are pathways to success.[24]

On the other hand, the FE regression of poverty incidence depicted in column 2 indicates that communities with higher shares of recent immigrant population exhibit higher poverty incidence.

[23] Osberg and Xu (1999) discuss that in 1995, Prince Edward Island scored high in reducing the per capita poverty intensity level compared to other provinces although PEI's poverty rate was similar to some other provinces. This was because the amount of money received by poor households as income assistance is higher compared to other provinces.

[24] Armstrong (2001) notes that the location of some poor aboriginal communities near major cities indicates that location alone does not explain their socioeconomic status. Therefore, for clusters of aboriginals' population in distressed neighborhoods the question becomes addressing the missing links. Particularly, for urban aboriginal population the issue should focus on constrained labor market participation despite tighter labor markets.

However, the share of aboriginal population is insignificant.[25] Unlike the case in the poverty gap regression, language proficiency plays a more important role. CCSs with increasing population shares that speak Canada's two official languages are associated with lower short-run poverty rates, suggesting that enhanced language supports would pay dividends as a tool for reducing poverty incidence. However, this does not hold in the poverty gap regression. Though LICO rate in its crude form might decrease with language support, LICO gap level is affected by other variables other than the language variables.

Almost all the human capital variables have the expected negative and significant coefficients in the poverty incidence FE regression. In comparison to the poverty gap model, however, the coefficient sizes are much smaller. For example, increasing the share of population with a university degree by one standard deviation is liked to reducing family poverty gap level by 0.03 percentage points compared to 0.002 percentage point reduction in poverty incidence. The poverty gap measure, thus, has higher elasticity with respect to the human capital variables in comparison to poverty incidence.

In the per capita poverty gap regression depicted in Column 3, the demographic variables show one unique result. Geographical concentrations of aboriginal Canadians have a positive significant association with poverty. This illustrates that the effect of higher concentration of aboriginal population is picking up a multiple of poverty factors that are pertinent to the households of aboriginal Canadians.

Moreover, the per capita gap measure exhibits higher association with demographic characteristics compared to the other poverty measures. This is because individual level variables tend to have higher correlation with demographic variables as opposed to the aggregate local economic characteristics. That is, poor individuals with low education and limited work experience are drawn to places that offer opportunities matching their skills and needs; for example, communities with a high share of entry-level positions and where living costs are low (Nord, 1998). Therefore, the per capita poverty gap is likely to be highly influenced by family composition and other sets of demographic variables such as average household size and other provincial fixed effects such as the choice of social policy. In this respect, Osberg and Xu (2000) note that differences in provincial welfare policies shape the variability in the per capita poverty gap level across provinces.

[25] In a separate regression (not-reported), I run a regression of the poverty incidence only for urban communities, the estimated coefficient for both recent immigrants and aboriginal Canadian were positive and significant. This denotes the clustering effect of vulnerable demographic groups in urban enclaves.

2.3.3 Geographic Variables

To account for labor market tightness, accessibility and agglomeration effects in the family poverty-gap, incidence and per capita regressions, the population within 100km and within 100 and 200km linkages and population density are included. Surprisingly, unlike the notions of positive agglomeration effects and better commuting linkages in reducing poverty, a larger population within 100kms is associated with greater poverty in all the three measures of poverty. Being located near a larger population base that is 100-200kms away is associated with lower family poverty-gap level. Remoteness might shield less-skilled poor workers from higher competition and less elastic labor supply, as a result of lower labor mobility in case of job growth (Bartik, 1993; Partridge and Rickman, 2008)

Similarly, across all the three different measures of poverty used in the analysis, the own-CCS population density coefficient is positive and significant. This result is consistent with constraints on labor market information and employment accessibility in more dense labor markets (Weinberg, 2004). For example, congestion in large metropolitan areas may limit the ability of the poor to access more distant parts of the city, especially if constrained to travel via public transit.

The comparison of the regression results from the above three different measures of poverty underscore that the economic variables play a central role in shaping community poverty rates and its depth in the medium or short term. However, the results also support the expectation that the relative importance of these demographic and economic variables differ in their impact in shaping these different poverty measures.

Therefore, looking at poverty-gap and incidence rate separately adds more explanatory power in explaining low-income dynamics and aids in developing effective poverty-reducing policies. For example the regression results show that the within R-square increases from 0.08 in the poverty-gap model to 0.25 in the poverty-incidence model. While, the between R-square changes from 0.04 in the family-gap model to 0.30 in the poverty-incidence model.

2.4 Sensitivity Analysis

This section presents the parsimonious re-estimations of the family poverty gap regression. First, I re-estimate the poverty gap regression for the urban subsample to review if poverty gap level follows a differential dynamics in urban and rural Canada. Furthermore, I include some additional explanatory variables and re-estimate the poverty gap regression by pooling data only for 1991,

1996 and 2001 census years. Finally, I re-estimated the poverty gap regression by including only the economic variables. The regression results of these parsimonious estimations are discussed below.

Column 4, presents the FE regression result for the urban subsample. Interestingly, male employment rates and unemployment rates are significant with expected negative and positive signs respectively. The share of self-employed females is highly significant and negative. This indicates that providing trainings or facilities for developing female entrepreneurs in urban Canada may be effective in combating poverty. Unlike the results in the family gap regression of the entire CCSs, the FE model for urban Canada shows greater statistical significance of human capital variables. Urban communities with higher shares of university or college graduates and high school diploma are associated with smaller poverty gap. [26]

Lone female headed households are one of the key demographic groups that are especially prone to poverty. In order to include this variable, data was pooled for only three census years which include this variable (1991, 1996 and 2001). [27] The result for this subsample is depicted in column 5 of table 2.2. In this regression, the result is similar to regression result in column 1 except for two notable differences. First, the share of lone-female households has a strong positive and statistically significant association with the local poverty gap. This result implies that a one standard deviation increase in the share of female-headed households increases the average family poverty gap level by 0.5 percentage points. This is particularly interesting because higher shares of single-female headed households may put extra burden on local poverty level. This illustrates a structural burden for these particular groups in moving them out of poverty through place based-policies such as employment growth and provision of better access to daycare centers for working single mothers. Secondly, the coefficient of recent immigrants in this regression is highly statistically significant. This illustrates, barriers to recent international immigrants might be compounded as community support mechanisms may be inadequate in smoothing their participation in the labor market. [28]

The response of poverty level to the dynamics of demographic and economic factors in high and low poverty areas can be different (Partridge and Rickman, 2005). To address this issue, I partition the data into high-poverty and low-poverty communities using a 20% LICO cut-point following a U.S. Department of Agriculture convention for U.S. counties (Partridge and

[26] The rural subsample regression results (not reported) are similar to the regression results from the full sample.

[27] Although persistent community-level household effects and time-series national trends in household composition would be accounted for by the community and time dummy coefficients in the fixed effects models, the statistical significance of the % share of lone-female headed households shows that it is not a persistent variable.

[28]Several studies in Canada indicate that after the 1990s the immigration system of Canada seems to be more attractive to non economic class immigrants with low skills and education compared to previous immigrants (Shiva and Kazempiur, 2000).

Rickman, 2005, 2006). This regression brings two unique results. First, the labor market tightness and agglomeration measures, population are not statistically significant. This illustrates that poor households in high poverty neighborhoods are less responsive to job opportunities in surrounding communities within the commuting distance. Second, in this high poverty subsample, the magnitude of the coefficient for recent immigrants' increased from 3.74 in column 1 to slightly more than 8. This result confirms the findings of Kazemipur and Halli (2000) and Fong and Shibuya (2003) on the concentration of recent immigrants and aboriginals in high poverty gateway localities.

In Column 7, following Chokie and Partridge (2008), the poverty gap regression in column (1) is re-estimated by including only the economic variables. The economic variables only are included to assess if the demographic variables are masking the impact of the economic variables. The findings show that the majority of the economic variables are significant without a huge change compared to the full sample result in column1. Therefore, multicollinearity is not driving the results. Although regression outcomes in the other specifications show that the demographic factors also have an impact on the poverty gap level, these results suggest that policies that target the economic variables would have higher pay-off in reducing family poverty gap levels in the short/medium-run.

2.5 Conclusion

This study assesses the regional variation in local poverty for nearly 2,400 rural and urban Canadian communities using 1981-2001 Census data. In doing so, three different measures of poverty are used to examine the response of local poverty to changes in local economic and demographic attributes. These measures of poverty include: average economic family's poverty gap, local poverty rate (LICO rates) and per capita poverty gap levels. By employing fixed effect panel data estimation technique, this study is able to identify the impacts of local demographic and economic factors on these different measurements of poverty and the corresponding policy implications.

The results from the fixed effects regression indicate that local economic/ labor market conditions have greater impacts in explaining the regional variation in poverty gap and incidence levels across communities. However, the response of the family poverty gap to changes in labor market conditions is higher compared to poverty incidence or per capita gap levels. On the other hand, individual poverty gaps are shaped mostly by community demographic structure. Hence, using different types of poverty measurements results in drawing slightly different conclusions on the relationship between place attributes and the poverty-level outcome.

This study also underscores that, even after controlling for local labor market conditions, higher

shares of lone-female headed families exert additional burden. This suggests the existence of some structural barriers in terms of employment access and labor market participation. Poverty in communities with higher aboriginal and recent immigrant population takes different dynamics. Higher shares of aboriginal population represent additional poverty *penalty* only in high-poverty communities, while the recent immigrant population share has a large statistically significant positive impact in urban poverty gap.

Looking beyond the incidence of poverty, policies that aim at reducing family poverty gap should target communities with greater shares of lone-female headed households and recent immigrants in reducing the structural barriers for these particular groups. Increasing the employability of single lone-female household heads through better day-care centers and training in both urban and rural Canada may be very effective. Similarly, facilitating the integration of recent international immigrants to the main stream Canadian culture and creating a network through which labour market information can easily reach these groups could pay high dividends. The results also indicate that policies that target augmenting the human capital level of communities coupled with targeted economic development and assistance can reduce poverty.

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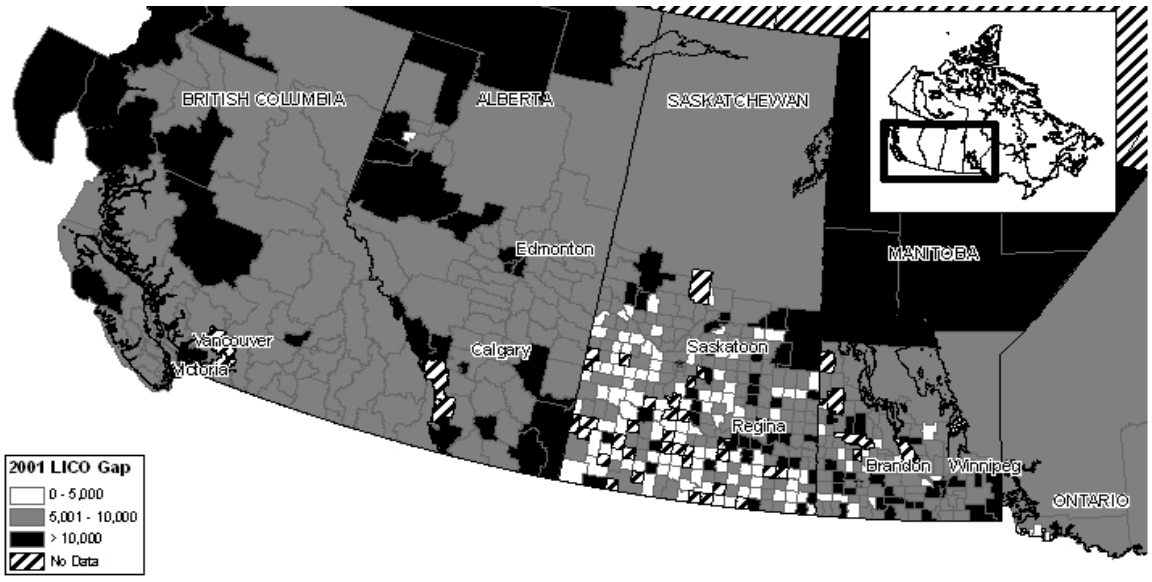
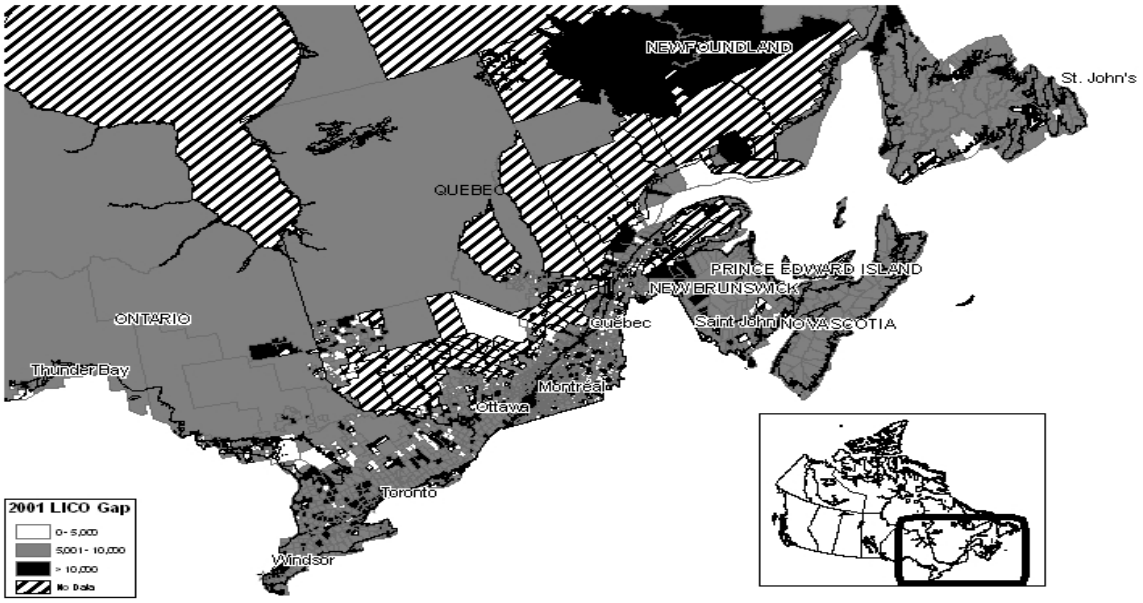
Figure 8. The Spatial Dimension of Family Poverty Gap (LICO GAP) in Western and Eastern Canada

Panel A Western Canada



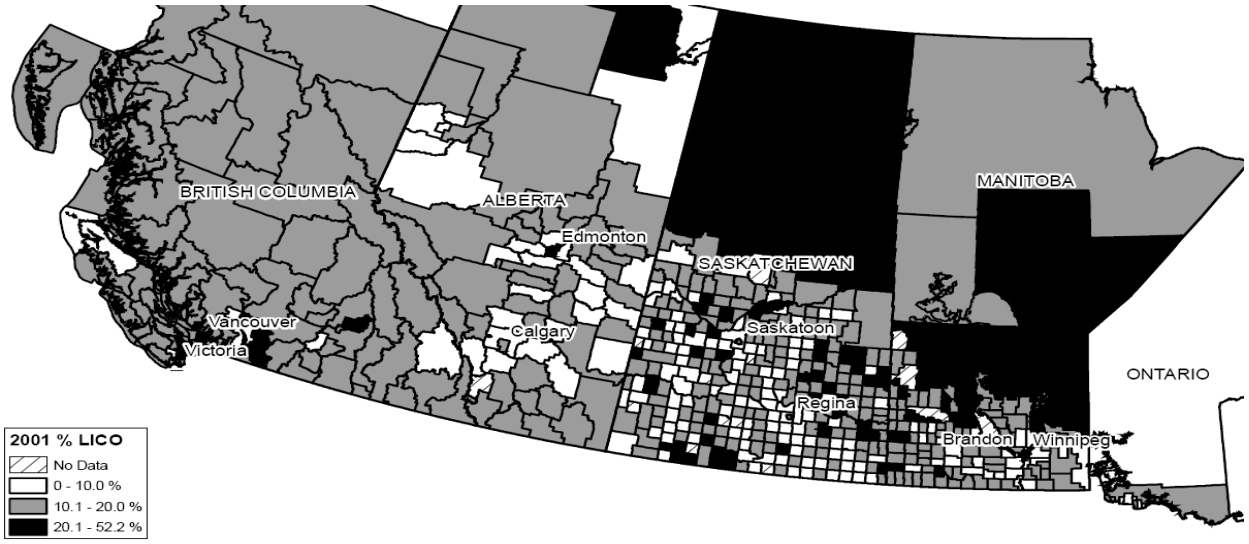
Panel B Eastern Canada



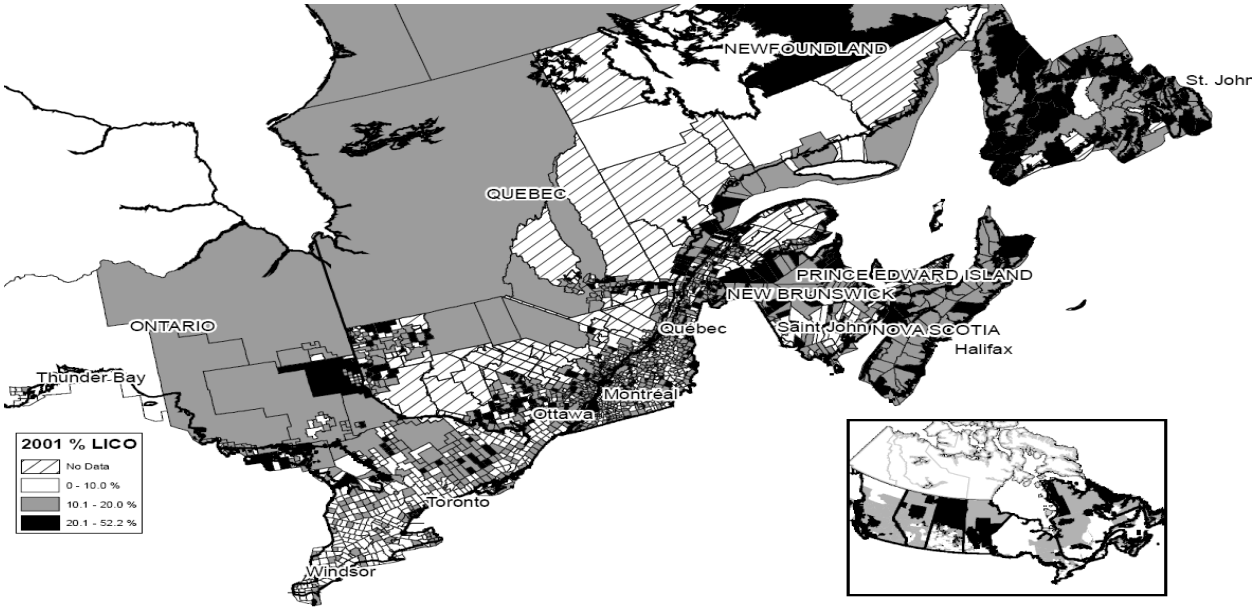
Note: **Panel A** shows Poverty Gap Level per family/LICO GAP level at the CCS level in western Canada while **Panel B** shows Poverty Gap Level per family in Central and Eastern Canada (using the 1996 LICO gap and 1996 boundaries). Northern territories are not shown. **White is $0-5,000, Grey is $5,000-10,000, and Black is $10,000 Dollars+.**

Figure 9. The Spatial Dimension of LICOs in Western and Eastern Canada.

Panel A Western Canada



Panel B Eastern Canada



Note: **Panel A** shows LICO/poverty rates at the CCS level in western Canada while **Panel B** shows CCS LICO/poverty rates in Central and Eastern Canada (using the 2001 LICO and 2001 boundaries). Northern territories are not shown. **White is 0-10%, Grey is 10%-20%, and Black is 20%+**

Table 2.1 Weighted and Unweighted Descriptive Statistics for Pooled Data [a,b]

Variables	Weighted Full Sample Mean	Weighted Full Sample Std Dev	Unweighted Full Sample Mean	Unweighted Full Sample Std Dev	Weighted Rural Sample Mean	Weighted Rural Sample Std Dev	Weighted Urban Sample Mean	Weighted Urban Sample Std Dev
Dependent Variables								
Family poverty gap /LICO gap level	9819.36	2477.32	7907.70	3076.04	8405.69	2911.73	10182.1	2212.17
Per capita poverty gap /LICO gap level	2097.79	523.206	1803.76	647.46	1788.34	572.43	2175.72	479.63
% poverty incidence (LICO Rate)	16.74	6.70	15.84	7.89	15.13	6.54	17.1	6.52
Economic Variables								
% employed males[c]	85.78	7.48	82.14	13.37	82.92	11.90	86.53	5.56
% employed females[c]	67.69	9.91	60.88	16.12	62.10	13.84	69.15	7.96
% unemployed males[c]	7.55	5.46	10.80	10.69	10.21	9.38	6.85	3.50
% unemployed females[c]	8.42	4.85	10.82	10.07	10.69	8.58	7.83	2.94
% agriculture	3.47	7.71	14.50	17.34	11.57	13.37	1.35	2.54
% other Primary sectors	1.99	4.45	4.50	7.40	4.79	6.94	1.26	3.13
% manufacturing	15.83	8.31	15.09	11.38	15.40	10.58	15.94	7.59
% construction	6.00	2.40	6.77	4.43	6.95	3.42	5.76	1.97
% distribution services	24.57	4.27	21.34	7.04	21.68	5.54	25.32	3.49
% personal services	12.10	5.38	6.58	4.44	6.80	3.54	13.49	4.89
% producer services	12.99	3.46	11.07	5.93	11.51	5.13	13.38	2.74
% nonfarm self employed males	11.53	3.66	10.85	6.81	11.92	5.45	11.42	3.01
% nonfarm self employed females	5.41	2.72	4.61	4.68	5.56	3.94	5.38	2.30
Demographic and Social Variables								
population density	1130.70	1505.80	74.81	342.56	19.83	24.62	1410.50	1565.26
% university graduates	9.81	5.67	4.50	3.48	4.61	2.54	11.17	5.47
% with some university education.	7.82	2.75	4.93	2.79	5.09	2.22	8.53	2.40
% with non university education	22.09	3.88	19.80	5.68	20.15	4.96	22.60	3.36
% high school grads but with no post sec. cert.	11.69	2.98	11.51	4.36	10.88	3.74	11.91	2.70
% non high school	20.68	5.66	22.82	6.25	23.67	5.66	19.90	5.39
% aboriginals	3.30	6.77	3.94	10.16	5.69	12.31	2.67	4.03
% recent immigrants	2.43	2.71	0.46	0.99	0.50	0.76	2.93	2.81

% lone female-headed family[d]	8.60	2.29	6.39	3.35	6.83	2.87	9.04	1.88
% same dwelling	33.35	16.96	33.19	26.87	33.08	24.66	33.43	14.27
% French and English (mother tongue)	6.34	12.22	5.16	10.98	4.50	10.59	6.82	12.57
% French only	21.29	34.35	39.30	44.12	27.15	40.02	19.75	32.53
% English only	71.02	37.69	55.26	45.75	67.95	42.20	71.83	36.38
Age Composition[e]								
% 60-70years old	9.23	4.06	10.43	5.12	10.19	4.70	8.98	3.83
% 25-59 years old	48.70	5.33	45.84	6.36	45.37	5.96	49.58	4.79
% 20-24 years old	7.73	1.97	6.56	2.45	6.70	2.13	8.00	1.83
%10-19 years old	14.68	2.73	16.27	3.58	16.33	3.04	14.25	2.47
% <10 years old	13.80	2.79	14.63	3.80	14.86	3.47	13.53	2.51
Place of Birth Origin								
% British Islands, North America and West Europe	88.46	12.77	98.45	3.57	98.36	2.27	85.87	13.12
% Caribbean /Latin/Central and South American	1.74	2.44	0.23	0.90	0.32	1.27	2.12	2.54
% East and Southern Europe	4.35	4.79	0.82	1.78	0.85	1.29	5.26	4.95
% Africa	0.72	0.89	0.08	0.28	0.07	0.17	0.89	0.93
% East and South East Asia	3.96	6.17	0.34	1.42	0.31	0.62	4.91	6.60
%West-central Asia and Middle East	0.61	0.95	0.04	0.23	0.03	0.09	0.77	1.02
Number of Observations	11136		11136		8719		2417	

a. The data for the four census years (1981, 1986, 1991, 1996,2001) are pooled together yielding 11,136 observations for the 2,607 CCCs. Due to concerns about outliers and Statistics Canada data suppression, the territories and CCSs with a population of less than 250 are excluded. Additional CCSs were omitted due to inconsistent or incomplete data (e.g. CCSs with reported income of zero).
b. the weighted descriptive statistics is weighted by the number of non-institutional population.

c. The employment rates and unemployment rates are measured for the prime-age workforce, 25-54 years old.
d. The data for % of female headed families and CCS own employment/ population ratio is calculated only for 1991, 1996, and 2001.
e. The population share over 70 years old is the omitted group

Table 2.2: Regression Results – Fixed Effects Model

Variable	Family Poverty Gap 1981-2001[a,b]	Poverty Incidence 1981-2001 [a,b]	Per Capita Poverty Gap 1981-2001 [a,b]	Family Poverty Gap Urban 1981-2001 [a,b]	Family Poverty Gap 1991-2001 [a,b]	Family Poverty Gap: High Poverty 1991-2001 [a,b]	Family Poverty Gap Only Econ Variables 1981-2001 [a,b]
% employed male	-2.44 (-7.40)	-0.11 (-15.31)	0.08 (1.55)	-1.32 (-1.67)	-1.29 (-2.23)	-2.59 (-3.05)	-2.90 (-12.73)
% employed female	-1.87 (-3.36)	-0.19 (-14.11)	-0.21 (-2.06)	0.77 (0.54)	-3.90 (-4.39)	-1.47 (-2.21)	-1.63 (-3.04)
% unemployed male	-0.57 (-1.54)	-0.02 (-1.95)	-0.01 (-0.20)	2.45 (2.43)	1.46 (2.11)	-0.26 (-0.39)	-0.38 (-1.10)
% unemployed female	-1.21 (-1.95)	-0.12 (-7.86)	-0.06 (-0.49)	-1.12 (-0.66)	-2.95 (-3.05)	-1.44 (-1.70)	-0.74 (-1.22)
% agriculture	3.55 (5.87)	0.15 (10.65)	0.07 (0.61)	7.65 (4.28)	3.88 (3.78)	-1.07 (-0.86)	5.01 (8.85)
% other Primary sectors	-0.28 (-0.38)	-0.05 (-3.06)	-0.27 (-2.09)	-0.58 (-0.34)	0.22 (0.17)	2.25 (1.83)	1.21 (1.75)
% manufacturing	-0.86 (-1.52)	-0.03 (-2.00)	-0.19 (-1.84)	-2.24 (-1.85)	0.04 (0.04)	-0.30 (-0.30)	0.04 (0.07)
% Construction	-0.90 (-1.16)	-0.06 (-3.02)	0.08 (0.59)	-2.52 (-1.53)	-0.70 (-0.55)	-4.38 (-3.69)	-0.20 (-0.26)
% distribution services	-0.54 (-0.93)	0.01 (0.62)	-0.01 (-0.06)	2.70 (2.14)	-1.02 (-1.08)	-1.74 (-1.74)	0.65 (1.16)
% producer services	-0.25 (-0.32)	0.03 (1.74)	0.08 (0.53)	2.29 (1.34)	-1.31 (-1.00)	-1.07 (-0.77)	0.71 (0.89)
% personal services	2.12 (3.28)	0.06 (4.11)	-0.18 (-1.48)	1.97 (1.33)	2.20 (2.01)	-0.42 (-0.39)	3.51 (5.55)
% nonfarm self employed male	-1.31 (-3.28)	0.01 (0.90)	-0.05 (-0.67)	-0.71 (-0.72)	-0.99 (-1.51)	-0.08 (-0.10)	
% nonfarm self employed female	-1.19 (-2.06)	-0.01 (-0.82)	0.32 (2.97)	-2.65 (-1.81)	-3.04 (-3.60)	-0.37 (-0.38)	
% lone female-parent families[c]	N	N	N	N	5.88 (4.17)	0.46 (0.32)	
% aboriginals	-0.46 (-0.60)	-0.14 (-7.38)	0.60 (4.46)	-3.20 (-1.67)	-1.86 (-1.31)	0.21 (0.14)	

% recent immigrants	3.47 (1.09)	0.19 (2.57)	0.50 (0.88)	12.75 (2.37)	13.62 (2.09)	8.70 (1.46)	
% English and French (mother tongue)	1.84 (0.56)	-0.33 (-4.35)	0.03 (0.06)	3.11 (0.28)	-16.57 (-1.54)	2.46 (0.21)	
% French only	2.65 (0.79)	-0.31 (-4.04)	0.19 (0.32)	3.38 (0.30)	0.03 (3E-03)	2.78 (0.29)	
% English only	3.81 (1.16)	-0.33 (-4.38)	-0.40 (-0.70)	6.31 (0.57)	0.86 (0.10)	1.95 (0.20)	
% university graduates	-0.04 (-2.66)	-2.4E-03 (-0.68)	-6.2E-03 (-0.24)	-0.07 (-2.91)	-0.02 (-0.82)	0.03 (0.90)	
% with some university education	-0.01 (-0.64)	3.0E-03 (-1.65)	3.0E-03 (-0.34)	-0.02 (-0.61)	-0.05 (-1.95)	-0.07 (-2.10)	
% with non university education (e.g., college)	-0.01 (-0.63)	-5.5E-04 (-5.03)	-1.1E-04 (-1.23)	-0.06 (-3.70)	-0.01 (-0.69)	-0.03 (-1.55)	
% high school grads	-0.01 (-0.82)	-7.9E-03 (-4.16)	-1.9E-03 (0.07)	-0.06 (-3.32)	-2.4E-03 (-0.14)	0.05 (2.70)	
% ed >8yrs but not HS graduate	0.01 (0.65)	-3.0E-03 (-1.83)	1.01E-05 (-3.02)	-0.01 (-0.60)	-0.02 (-0.85)	-0.01 (-0.39)	
population within 100KM	3.68 (5.71)	1.2E-04 (0.08)	0.29 (2.56)	0.02 (0.02)	6.13 (3.84)	0.65 (0.28)	
Population between 100KM and 200KM	-2.08 (-2.88)	-4.3E-03 (-0.24)	-0.29 (-2.42)	0.07 (0.06)	-5.22 (-3.02)	0.54 (0.22)	
Population density	1.6 E-04 (1.90)	8.5 E-05 (3.90)	4.2 E-04 (3.08)	3.2 E-04 (0.59)	6.9 E-04 (0.38)	-4.63E-04 (-0.27)	
% age composition variables	Y	Y	Y	Y	Y	Y	N
Place-of-birth-origin variables	Y	Y	Y	Y	Y	Y	N
Time Dummy[d]	Y	Y	Y	Y	Y	Y	Y
R^{2} [e]	0.08	0.25	0.25	0.08	0.05	0.18	0.06
Number of observations	11136	12102	10377	2417	6708	1190	11136

Notes: a. The dependent variable in columns (1), (5), (6) and (7) is the family poverty-gap level (family LICO-gap). The family poverty gap is defined as the average number of dollars that would be needed to give to an economic family under LICO to raise its income to the LICO level. In Column (2), the dependent variable is poverty incidence (LICO rate) and it is defined as the percentage of population with income below LICO. In column (3), the dependent variable is the per capita poverty gap level, defined as poverty gap per poor individual. The values in parentheses are robust t-statistics. The robust t-statistics are adjusted for regional clustering of the error terms in all regressions. See the text for details.

b. See the text and Table 2.1 for listing of variables.

c. Percentage of lone-female headed families is included only for the pooled data for the period 1991-2001.
d. The time dummies account for the years 1981,1986,1991,1996 and 2001 in Columns 1, 2, 3, 4 and 7.While, in columns 5 and 6 time dummy covers 1991, 1996 and 2001.
e. The R^2 statistics for the fixed effect models are the within-CCS measure of explained variation using STATA.

Essay 3: Regional Analysis of Job Access and Wages in Rural and Urban Canada

3.0 Introduction

The role of distance in shaping labor market outcomes and job search efficiency is well recognized. For example, rural Canada tends to have much lower wages than urban Canada, while many remote rural areas lag urban Canada in terms of job growth (Beckstead et al., 2010; Vera-Toscana et al., 2002, 2004; Statistics Canada, 2006). Likewise, in urban areas, it is often asserted that job sprawl and decentralization reduces employment access as it increases the physical isolation of jobs thereby reducing information and efficiency in the optimal job search process (Zenou et al., 2003; Johnson, 2006; Wasmer and Zenou 2002; Ihlanfeldt and Sjoquist, 1990, Ihlanfeldt, 1997; Chrinko, 1982). However in rural areas, a similar phenomenon exists in that increasing rural-urban commuting distance might lead to a negative labor market outcome and concentration of poverty in regions (Partridge and Rickman, 2008a; 2008b; Chokie and Partridge, 2008). Therefore, generic job access and relative location of employment opportunities in relation to the potential labor market participants is fundamentally important in determining labor market outcomes.

Generally, higher labor market participation and employment growth have a positive impact in reducing prevalence of low-wage earners (poverty).[1] In this regard, greater job access helps reduce poverty through increasing average wages and creating more employment (Partridge and Rickman, 2005; Weber et al., 2005). However, where there are local barriers in accessing national growth in jobs or within region differences in labor force participation (rural versus urban), the aggregate patterns may not reduce poverty. This paper, therefore, reviews the nature, magnitude and direction of labor market responses and wages across Canadian communities in relation to job creation and accessibility. In doing so, a theoretical model is presented that captures the interaction between generic job creation, accessibility and wage determination. As opposed to the urban-oriented literature from the United States, this paper uses "Spatial Mismatch"[2] as a

[1] Statistics Canada Census data in 2006 shows that almost half of low wage workers were their family's major income earners. It further notes that this group is much more likely to experience low income (considered poor).

[2] The Spatial Mismatch Hypothesis (SMH) was formulated by Kain (1968) for U.S. urban labor markets. SMH according to Kain (1968) contends that limitations on black residential choice along with decentralization of jobs from central cities are responsible for the low rates of employment and low earnings of Afro-American workers. However, this study does not explicitly test for SMH in Canada. Weinberg (2004), notes that SMH should shift attention from residential segregations along racial lines to issues of commuting, employment decentralization, and understanding the nature of spatial barriers to employment, which this paper is mainly preoccupied. For example, Partridge and Rickman (2008a) using insights from urban poverty literature use spatial mismatch to explain high poverty in rural America.

backdrop in analyzing spatial heterogeneity and differential labor market outcomes in urban and rural Canadian communities. In particular, this study explores whether better employment access (geographic proximity) will improve labor market outcomes for low-wage earning rural and urban Canadians. In doing so, special attention is given to communities with greater concentration of recent immigrants and Aboriginal Canadians to account for institutional and other labor market barriers that these vulnerable demographic groups encounter.[3]

This paper has three main findings. First, it finds that better job-access is inversely related to the proportion of workers who are low wage earners (those with hourly wage less than $10 per hour). This relationship is stronger in rural communities; however, in urban areas prevalence of low-wage earners has no association with job access. Human capital plays a prominent role in urban areas. Nonetheless, the paper finds evidence that communities with higher shares of recent immigrants and aboriginal Canadians have positive association with low wage share even after controlling for human capital and other factors. Finally, greater job accessibility has a strong direct association with average wages in both urban and rural areas. Nonetheless, local job availability has a positive significant effect only on rural average wages. In urban Canada, skill (human capital) plays a key role in shaping local average wages.

The paper is organized as follows. The next section (2) presents the theoretical model that links space, search and efficiency interaction in both the land and labor markets equilibrium in generating the wage equation. Section 3 discusses the empirical estimation technique and data. The fourth section provides the regression results and finally the fifth section concludes.

3.1 Model

In setting up the model I follow Wasmer and Zenue (2002) spatial model of search and efficiency interaction in both the land and labor markets. In their model, land and labor markets interact simultaneously to achieve market equilibrium levels of land price (rents) and wages across space. Their model also decomposes the equilibrium wage and rent levels into a pure non-spatial components and a spatial dimension that represents a friction in generic job access. This friction introduced by distance is due to the transportation and information costs. In setting up their model Wasmer and Zenue (2002) assume that workers and firms are identical (ex-ante).

I relax the assumption that workers are identical to account for the presence of "mismatch" for specific workers (e.g. immigrants and aboriginals). In which case, there will be additional friction in the labor market besides distance and other labor market shocks which affect all workers

[3] Aboriginal Canadians and recent immigrants make up the bulk of the Canadian poor (Chokie and Partridge, 2008).

uniformly. This extra friction is manifested in terms of minimal integration to the main stream labor market caused by language and institutional barrier. Therefore two kinds of friction are taken into accounted. First is the generic distance friction (α) which is the same for all workers. Second is the extra "Mismatch index" for aboriginal Canadians and recent immigrants represented by "$\gamma_{i,abo}$" and "$\gamma_{i,immig}$" respectively for a community *i*, and both are assumed to be increasing with distance. The "*extra"* friction in the labor market for *these* particular demographic groups is generated by the *spatial mismatch*.[4] The higher the commuting distance from the place of residence, the greater is the mismatch index. This extra friction affects the average wage level of these demographic groups negatively. In which case, the mismatch index is higher for a recent immigrant worker who lives in region *i*, and works in region *j* with a commuting distance of *d*, compared to one who lives and work in the same community ($\gamma_{i,i,immig} < \gamma_{i,j,immig}$). This also holds true for an aboriginal worker.[5]

In what follows the job matching process, search efficiency determination and the labor and land markets configuration is presented.

3.1.1 Labor Market

The process by which job seekers fill vacancies posted by firms is assumed to be a random Poisson process. Thus, the following matching function in equation (1) determines the number of contacts per unit of time between firms and workers:

$$M = M(\bar{S}_i(U_i + U^d), V_i + V^d) \tag{1}$$

Here, $\bar{S}_i$ is average search efficiency of the unemployed workers. The matching process (*M*) reflects the aggregate search frictions and labor market information. U_i and V_i denote the size of the unemployed pool and the number of new vacancies in the region respectively. Similarly, U^d and V^d represent the unemployed pool and new vacancies in regions which are within the commuting shed of region *i* (i.e. workers in region *i* have access to vacancies both in their own community and in a region within commuting distance). The matching function is assumed to be concave and is increasing in both its arguments. It is also assumed to exhibit constant returns to scale (homogenous of degree one). In other words, the matching function will increase by 1 unit if both the search efficiency and number of vacancies increase by 1 unit.

[4] The language and institutional barriers are associated with slow integration of immigrants and aboriginals to the main stream Canadian culture and statistical discrimination in the labor market.

[5] In what follows the mismatch parameter is denoted as only γ *indicating a vulnerable* worker.

The probability for a vacancy to be filled per unit time (by constant returns to scale) can be written as:

$$q(\theta) = \frac{\bar{M}(S(U_i + U^d), (V_i + V^d))}{(V_i + V^d)} = M(\frac{1}{\theta}, 1) \qquad (2)$$

where $\theta = \frac{(V_i + V^d)}{\bar{S}(U_i + U^d)}$ is the measure of labor market tightness.[6] That is, accessible total vacancies relative to not -employed persons within the commuting shed (for a given level of efficiency) defines the labor market tightness. In which case, $q'(V) < 0$, $q'(u) > 0$ and $q'(\theta) < 0$. From the workers' side, the probability of an unemployed worker finding a job with efficiency of (S_i) is given by:

$$\frac{\bar{M}(\bar{S}(U_i + U^d), (V_i + V^d))}{U_i + U^s} \cdot \frac{S_i}{\bar{S}} = \theta_i q_i(\theta) S_i = P_i \qquad (3)$$

P_i represents the exit rate from unemployment. However, the individual search efficiency (S_i) depends on the distance of the unemployed worker's residence from the potential job location. In addition, S_i also depends on the level of mismatch index γ_i, which is directly proportional to distance. Thus $S_i = S_i(d_i, \gamma_i)$ Where $S'(d) < 0$ and $S'(\gamma_i) < 0$.[7]

Therefore :-

$$s_i(d, \gamma) = S_0 - (\alpha + \gamma_i) d_i \qquad (4)$$

$S_0 > 0$ and $\alpha > 0$. The standard non-spatial component that comprises the search effort (e.g. looking at local newspaper ads, local radio advertisement etc.) is denoted by S_0. The loss of information due to information decay with distance is captured by α. Nonetheless, the marginal negative effect of distance is not uniform across all communities with equal distances. Regions with different demographic composition (aboriginal and immigrants) and infrastructure (highways /public transits) are expected to experience differential distance effects reflected in the mismatch parameter γ. The total distance effect is decomposed into *pure distance* part which is captured by "αd" and the extra mismatch friction which is accounted by "γd"

[6] Using the properties of the matching function in equation (1), the labor market tightness is inversely related to the probability of filling a vacancy by firms.

[7] Based on the assumption of non-identical workers, higher labor market experience and minimal institutional and other employment barrier could lead to lesser marginal effect of the mismatch index.

The above matching function determines the match between firms and workers and thus determines the wage rate. The possibility of the match being destroyed is also assumed to occur at a rate of δ per unit of time. Hence to determine the general equilibrium level of wages and rent, the land and labor markets equilibrium have to be achieved. Thus location choice of workers, their search efficiency and distance determine the partial labor market equilibrium. Market equilibrium is the condition where the wage rate (labor market), and rental levels (land market) interact to equilibrate the market over space simultaneously.

3.1.2 Land Market

Wasmer and Zenue (2002) follow the standard urban economics literature in setting up the land market equilibrium, where the area is mono-centric, it is linear closed and landlords are absent. They also assume that workers are uniformly distributed along a linear piece of land with varying residential location vis-à-vis the employment center. Workers consume equal amounts of land, normalized to 1 and the land parcel is taken to be unity so that there are exactly d units of housing within a distance of d from the employment center.

Employed workers pay the transportation cost of t_e to go to work and the unemployed pay t_u to travel to employment centers to solicit jobs. Moreover, both the employed and the unemployed pay a rent of *R(d)* based on their residential location from the business center. The unemployed also have a non-wage income *b* (e.g. employment insurance).

Assuming zero relocation costs, the intertemporal utility functions of the employed and not employed are given by:

$$rI_u(d) = b - t_u d - \gamma d - R(d) + p(d)[\max I_e(d') - I_u(d)] \quad (5)$$

$$rI_e(d) = w - t_e d - R(d) + \delta[\max I_u(d') - I_e(d)] \quad (6)$$

where I_u and I_e represent the discounted lifetime income of the unemployed and the employed respectively; and *r* is the exogenous discount rate. Equation (5) represents the intertemporal utility function for the unemployed worker residing at a distance of *(d)* from the employment center, receiving employment insurance of *b* will have net income of $(b - t_u d - \gamma d - R(d))$. The loss of income due to the extra friction in job search caused by "spatial mismatch" is represented by γd. When the unemployed worker gains employment with a probability of *p(d)*, then he/she will

relocate to an optimal distance *d'* and his/ her net income increases to $I_e(d') - I_u(d)$.[8] The interpretation for equation (6) for the employed worker is similar.

From equations (5) and (6), the equilibrium in residential location occurs at a point where all the employed attain equal utility and all the unemployed enjoy the same level of utility ($rI_u = rI_u^*$ *and* $rI_e = r\,I_e^{*)}$. In this regard, the spatial mismatch that generates friction would lead to the relocation of residence to closer proximity to the employment center depending on the magnitude of ($I_e(d') - \gamma d$). If the loss in income due to spatial mismatch is sufficiently high, exit from unemployment would lead to relocation to places closer to the employment center (i.e. $d' < d$) to avoid loss in income. Therefore, the core contribution of my study is to explicitly account for the presence of spatial mismatch effects in both labor and land market outcomes for heterogeneous workers.

Based on the indirect utility levels in (5) and (6), the maximum bid rent of the unemployed and employed for a residential place located at a distance of *d* is given by:

$$\overset{\max}{R}_u(d) = b - (t_u + \gamma)d + p(d)\,I_e^* - (r + p(d))\,I_u^* \qquad (7)$$

$$\overset{\max}{R}_e(d) = w - t_e d + \delta\,I_u^* - (r + \delta)\,I_e^* \qquad (8)$$

Therefore, the maximum bid rent of a given area will be given as Max $\{Max\ R_u(d), R_e(d), R_A\}$, where R_A is the value of undeveloped agricultural land.[9]

Thus, to formally drive the land market equilibrium, the labor force is normalized to 1. In this case, since the land consumption a linear continuum where there are exactly *d* units of housing within a distance *d* of the employment center; and if d_b is the border between the employed and the unemployed (u):

$$d_b = 1 - u \qquad (9)$$

at d_b the search intensity is given by (i.e. modified equation (3))

$$P(d_b) = [S_0 - (\alpha + \gamma)(1 - u)]\theta q(\theta) \qquad (10)$$

Likewise, using (5) and (6), at d_b :

[8] Moving costs assumed to be zero, thus the differential effect of residential change is translated in terms of commuting cost to work or to find work (t_e *or* t_u) and rent *R(d) or R(d')*.

[9] Wasmer and Zenue (2002) focus on the ultimate location of the employed and the unemployed based on the slope of their bid rent and transportation cost. However, in this paper we adopted their model with the purpose of deriving the wage equation that is explicitly determined by the level of mismatch and generic job creation reflected by the tightness of the labor market.

$$I^*_e - I^*_u = \frac{(w - b - (t_e - t_u - \gamma)d}{r + \delta + p(d)} \qquad (11)$$

The ultimate objective is to derive the wage equation by using equations (1) to (11) that encompasses both labor market tightness and the mismatch parameter. In this regard, the wage level is determined in the labor market equilibrium where both firms and workers maximize their surplus. Let the profits for a job be represented I_j and let I_v represent the profits of a vacancy.[10] The product for the firm from matching is denoted as Y and r is discount rate. Therefore, the job and vacancy profit functions can be written as:-

$$rI_J = Y - w + \delta(I_v - I_J) \qquad (12)$$

$$rI_V = -\psi + q(\theta)(I_j - I_V) \qquad (13)$$

Equation (12) represents the intertemporal profit from jobs. It depicts the net result of the output produced minus the wage paid to employees and the change in profit when the matching is destroyed (job destruction) with a probability of δ. Similarly equation (13) represents the net profit from a vacancy which is the sum of output loss (ψ) during the matching process and plus the change in inter temporal profit when the vacancy is filled with the probability of $q(\theta)$.

Assuming that the returns from a vacancy is zero in the long run, $I_V^*=0$. Using equations (12) and (13) we get:

$$\frac{\psi}{q(\theta)} = \frac{Y - w}{r + \delta} \qquad (14)$$

Likewise, assuming $I_V^*=0$, from (13) the value of job is given as:

$$I_J = \frac{\psi}{q(\theta)} \qquad (15)$$

Following Pissarides (1987), wages are determined by a Nash bargain between the matching firm and worker. The firm and worker who establish a job match will generally have some monopoly surplus to share. Thus the standard Nash bargain wage equation can be presented as:

$$w = \arg\max(I_e^* - I_u^*)^{\beta}(I_j - I_V)^{1-\beta} \qquad 0 \le \beta \le 1 \quad (16)$$

[10] In relation to equation (12) Pissarides (1987) assumes that vacancies cost the firm a real (flow) of constant cost. The cost of a vacancy may include advertising costs, any fixed costs associated with a job and generally any foregone output that is not matched by a reduction in costs.

In the above equation, β represents the bargaining power of workers that determines the wage rate. The first order conditions of equation (16) gives:

$$(1-\beta)(I_e^* - I_u^*) = \beta(I_j - I_V) \qquad (17)$$

Using Equation (11) and (14)

$$(1-\beta)\left[\frac{(w-b-(t_e-t_u-\gamma)d}{r+\delta+p(d)}\right] = \beta\left[\frac{\psi}{q(\theta)}\right] \qquad (18)$$

Re-arranging and substituting $P(d)=\theta_i q_i(\theta)S_i$ from equation (3), equation (18) can be written as:

$$(1-\beta)[w-b-(t_e-t_u-\gamma)d] = [r+\delta]\beta\frac{\psi}{q(\theta)} + \theta_i \cdot S(d)\beta\psi \qquad (19)$$

The distance *d* in (19) is defined by (9).

Using equation (14) $[r+\delta]\frac{\psi}{q(\theta)} = Y - w$

Thus Equation (19) can be re-written as:

$$w = (1-\beta)[b + (t_e - t_u - \gamma)d_b] + \beta[Y + (S_0 - (\alpha+\gamma_i)d_b)\theta\psi] \qquad (20)$$

Equation (20) depicts that both spatial and non spatial factors shape the level of wages in the labor market at a point ($d_b = 1-u$). At, d_b the boundary between location of the employed and the unemployed, the bid rent difference vanishes. Hence, $(1-\beta)b + \beta[Y+S_0\theta\psi]$ represents the share of the gain to workers from the bargaining share of the surplus from matching. Similarly, $(1-\beta)(t_e - t_u)d_b - \beta\alpha\gamma\theta\psi d_b)$ is the pure distance or spatial effect. Nonetheless, our main point of interest is the last spatial effect which constitutes both the pure distance effect and the spatial mismatch parameter (i.e. α, γ). So, the empirical section analyzes how proximity to jobs shape wage rates across Canadian communities by using the concept of spatial mismatch in both urban and rural Canada. Special attention is given to the relationship between low-wage earners and generic job accessibility.

3.2 Empirical Estimation

To empirically investigate equation (20), I explore the variation in the proportion of low-wage earners (less than 10 dollars per hour)[11,12] across 2,600 Canadian communities in 1996 using explanatory variables from 1981 and 1991 census data. The unit of observation in the analysis is the Consolidated Census Sub Divisions (CCS)[13]—which are approximately communities. I use Statistics Canada's Place-of -Work and Residence data to measure the degree of local and regional job-accessibility/ proximity in each community. The place-of –work data is acquired from Statistics Canada's, Census of population, special tabulations for the experienced labor forces 15 years and over available at the 1996 constant boundary. The CCS's demographic, economic and geographic attributes will be proxy measures for transportation cost, mismatch, output and labor market tightness.

The empirical model relates the proportion of low wage earners (< $10 per hour) in a given CCS to the CCS's own economic and demographic attributes, as well as geographic variables (e.g. distance from an urban core). Hence, the objective is to model the relative importance of worker location relative to location of jobs, and characteristics of the workforce in general. The econometric model is shown as follows for CCS *i* located in province *p*:

$$\mathbf{P}W_{<10,ip,1996} = \mu + \pi\,\mathbf{Jobaccess}_{\mathbf{ip,\,1991}} + \varphi\,\mathbf{DEMOG}_{\mathbf{ip,\,1991}} + \zeta\,\mathbf{ECON}_{\mathbf{ip,\,1991}} + \mathbf{PROV}_{\mathbf{p}} + \varepsilon_{ip,\,t} \quad (21)$$

The dependent variable ($PW_{<10,ip,1996}$) is the share of workers in a CCS with hourly wage level less than 10 dollars per hour in the census year 1996.[14] $\mathbf{Jobaccess}_{\mathbf{ip,\,1991}}$ denotes the 5 year lagged measure of job access in the CCS. The CCS's geographic attributes will be proxy measures for transportation cost, and the demographic composition will account for the mismatch parameters and the economic attributes will account for output and labour market tightness. Non-labor income, however, is not included in the regression as it might be endogenous to the low-wage

[11] The emphasis is on workers in the lower tail of the wage distribution as spatial mismatch and distance have proportionally higher influence on lower wage earners.

[12] The $10 per hour is used because of data availability and it reflects the average minimum wage across provinces.

[13] The specific geographic groupings are Consolidated Census Subdivisions (CCS)—which are approximately communities. A CCS is a grouping of adjacent census subdivisions, which forms more cohesive regions both geographically and economically. Generally the smaller, more urban census subdivisions (towns, villages, etc.) are combined with the surrounding more rural census subdivision to create a geographic level between the census subdivision and larger census division (du Plessis et al., 2002).

[14] Several other studies at micro level have defined low-wage differently, for example (Vera-Toscano et al.,2003) define low wage as the hourly wage rate less than two-thirds of the overall median wage. For the Census year of 1996 the hourly wage rate that is less than two–thirds of the overall median wage was 11.83 which is similar to the $10 value used in this study.

share. That is, a CCS may have higher share of non-labor income due to high shares of workers in the lower tail of the wage distribution. Nonetheless, the fixed effects component is expected to account for the differences in non-labor income across CCSs. The DEMOG and ECON are vectors that include both and demographic and economic community characteristics, which are briefly described below.

Job access is the measure of generic job availability or measure of labor market tightness -- the variable of interest. A good measure of job-access should account for job proximity, competition and also labor market segmentation. That is, it should account for both job-accessibility and proximity. As a result, job access is measured in two ways. The first measure is the total number of jobs in the CCS --job availability. The second measure is job-proximity -- distance weighted number of jobs in neighboring CCSs. Hence the total number of generic job accessible to a worker in a CCS can be shown as:-

$$Jobaccess_i = jobs_{i,i} + \sum_{j=1}^{n}\left(\frac{Job_j}{(d_{i,j})^2}\right)$$ where $\boldsymbol{Jobs_{i,i}}$ denotes the total number of jobs in the CCS or community. This includes the number of jobs of both residents and in-commuters. The second part includes the sum total of jobs in neighboring CCSs weighted by distance. The distance weight utilized here is the square of distance so as to penalize distant places due to diminishing returns to search when people live far away (Partridge and Rickman 2008a; 2008b; Barron and Gille, 1981 and Chirinko, 1982) that arises due the loss of information and cost of commuting to further distance (Lucas, 2001).[15]

However, in the regression model, the two components are entered separately for two reasons. First, the relationship between job proximity and the labor market outcomes is highly interlinked with residential choice of workers, which could be endogenous in the model. In this regard, Weinberg (2004) notes that, estimates will be biased upward if workers with higher labor market participation choose to live near employment locations. Therefore to mitigate any potential endogeneity problem, 10 year lagged values of the two decomposed job access measures are used. Hence job accessibility measures are both taken from 1981 census data making the model

[15] For the purpose of the study generic job access is deemed important in explaining regional variation in wage patterns. However, the importance of natural amenities in determining the difference in regional wages or concentration of firms in certain regions has been discussed as better proxies for regional differential in employment and wages (e.g., Roback, 1982).

more conservative. However, neither measure reflects market segmentation. Hence, these measures portray generic job access.[16]

DEMOG is a vector of demographic variables for the census year 1991. It includes the key parameters of interest for measuring mismatch i.e. the local share of aboriginal population and recent immigrants. Recent immigrants constitute international immigrants who have been in the country for less than 5 years. These two demographic groups represent those that face structural or institutional barriers in the labor market. Hence, CCSs with higher share of these demographic groups are expected to exhibit higher share of low-wage earners. This will capture the difference in the effect of labor market shocks for workers that have different mobility (Bound and Holzer, 2000).

Educational attainment shares are included to account for employability or skill difference (share of population with less that grade 9 level being the omitted category). Higher educational attainment level is expected to have an inverse relationship with low-wage earners. Likewise, the percentage of the population that speaks English, French, or are bilingual (English and French speakers) are also added as additional measures of friction and mismatch measures.

Statistics Canada (2006) note that the proportion of the youngest workers aged 16-24 in low-wage jobs is 3 to 4 times that of older workers aged 25 to 60. This is attributed to differences in job tenure and experience. Hence, to account for the variation in tenure and experience, CCS share of population between the ages 24 to 60 and share of population between the ages 15 to 24 are included. CCSs with a higher share of population in the prime labor force group and higher labor market attachment or participation are expected to exhibit lower share of population earning minimum wage and *vice versa*.

On the other hand, the key *economic* variables **(ECON)** include CCS industry employment shares, to account for regional differences in economic specialization. Regions with higher shares of employment in agriculture and primary sectors are expected to exhibit positive association with the share of low-wage earners. The CCS unemployment population ratio is also included in this vector. Communities with higher unemployment rates are expected to have higher share of workers which earn low- wage, *ceteris paribus*.

[16] *Job-access* is the total job access or total job access/ proximity to the CCS. This includes the total number of jobs in the CCS plus distance weighted surrounding CCSs job availability. To measure the job-access, there is no cut-off distance to job-accessibility in remote CCSs, thus the distance weight utilized is as a function of the distance squared. Higher weight is given to communities within the commuting region. Particularly, special attention is given to CCS's own job availability as less-skilled workers are more sensitive to their own local labor market. This will also shed the effect of transportation and residential location.

To capture the effect of congestion and cost of information, CCS-own population density is also accounted for. Provincial fixed effects (*PROV*) are included to account for unique provincial characteristics, such as differences in government policies, welfare programs, and culture.[17]

Finally, to mitigate any potential spatial autocorrelation, the empirical estimation is performed by assuming that CCS residuals are correlated within a given Census Division (CD), but uncorrelated across CDs, which adjusts the t-statistics in a manner similar to the White correction for heteroscedasticity.[18,19] This clustering approach does not impose any restriction to residuals of CCSs within the same CD unlike other spatial autocorrelation where some assumptions are put in place to measure the degree and extent of correlations based of geographic proximity.

3.2.1 Descriptive Statistics and Data

Table 3.1 depicts the un-weighted descriptive statistics of the data used in this study across regions. The total sample size included in the study is 2,600 CCSs. However, due to incomplete data and Statistics Canada's data suppression, the sample only has 1,912 CCSs with complete data. From the 1,921 CCSs with complete data, 483 CCSs are urban and the remaining 1,438 CCSs are rural. The value of the dependent variable is from 1996 census year, whereas the explanatory variables are taken from 1991and 1981 census years.

The first column shows the mean value of variables in the entire sample whereas the third and fifth columns show the values in the rural and urban subsamples respectively. Data from the full sample shows that in 1996, the share of workers with earnings below $10 per hour was around 33.6 %. In urban Canada it was 25.6% whereas in rural CCSs it was 36.3%. This indicates that urban Canada has a lower share of *"minimum"* wage earners compared to rural Canada. Both job proximity and availability measures are greater in urban Canada. For example, the average number of jobs in an urban CCS is around 23,934 compared to 1,539 in rural areas. In addition, the number of distance weighted average number of jobs for an Urban CCS is around 1,205 compared to 263 in an average rural CCS. Among the demographic factors, there is a higher share of recent immigrants is in urban Canada whereas the share of aboriginal Canadians is greater in rural Canada. Similarly, human capital levels are higher in urban Canada.

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[17] To control for elasticity of labour supply to in-commuting and out-commuting rates to and from a CCS, CCS in-commuting and out-commuting rates were included but the two variables were found to be statistically insignificant and were dropped due to high co-linearity with other variables.

[18] Statistics Canada defines a CD as a provincially legislated area (such as counties, *municipalité régionale de comté*, and regional districts) or their equivalents. CDs are generally constructed to reflect functional economic regions. There are 288 CDs using 1996 boundaries.

[19] The corresponding robust t-statistics are calculated using the STATA econometric software Cluster option.

3.3 Regression Results

This section presents the regression results of various estimations of equation 21. Table 3.2 depicts the regression estimation results for various specifications and subsamples. In what follows I briefly discuss the regression results.

Table 3.2, column 1 presents the parsimonious regression where the dependent variable (percentage of low-wage earners) is regressed on only provincial dummies and job-access measures. The findings indicate that share of low-wage earners is inversely related to job-access. That is, tighter labor market or better job access increases the search intensity of workers and thereby employment outcomes or wages (Patacchini and Zenue, 2006). To address the rural-urban differences, I run the same specification for the rural and urban subsample (not-reported). The results clearly indicate that after controlling for provincial dummies and spatial clustering, the effects of job access and availability in both rural and urban Canada are negative and significant. However, the magnitude is greater in rural Canada compared to urban Canada. Given the amount of competition and responses from other regions to labor market shocks in urban Canada the result is expected.[20]

Following Duranton and Turner (2011), in order to test the validity of using 1981 values of CCSs jobs and job proximity as instruments for the 1991 values of these variables, I try to show that instruments need to predict 1996 job access but be otherwise uncorrelated with 1996 low-wage or average CCC wages levels. Therefore, the instruments need to be tested for relevance and exogeneity. In doing so, first under-identification test (Kleibergen-Paap rk LM statistic) is performed. This is to verify that the instruments are strong and highly predict the endogenous variables. The under-identification test result is presented on the bottom of table 3.2. It shows that the null hypothesis that the regression model is under-identified is rejected at conventional levels of significance. The very high partial r-squares (0.99 for Job access and 0.98 for local jobs) from the first stage regression indicate the strength of the instruments. However, it is also important to test for a second criterion, instrumental relevance. Stock and Yogo (2005), suggest that many applications of instrumental variables (IV) regressions suffer from "weak instruments" or "weak identification". The bottom line of Table 3.2 reports the Cragg-Donald Wald F-statistic for the

[20] In a rural poverty study in the U.S., Partridge and Rickman (2008b) find a positive link between rural remoteness and poverty due to smaller labour market supply responses which produce a form of rural Spatial mismatch.

weak instruments test of Stock and Yogo (2005). Statistical significance based on the Stock-Yogo critical values indicates the instruments are strong.[21]

To assess the effect of other labor market related issues, the base line regression in Column 1 is re-estimated by including all relevant variables that could be correlated with the job-access measure. Hence, column 2 includes, human capital, industry employment shares and to account for regional commuting effects. After controlling for all these covariates, the coefficient of the job-access measure is still negative but the magnitude is lower in absolute value and insignificant at conventional levels of significance. This could be due to the fact that in the previous regression job-access was picking up the effect of the other omitted covariates.

Local industry composition shapes the breakeven point of firms and wages and it might attract workers that could suit the needs and demands of industries. Hence, to address this labor market segmentation, I included the shares of the six-industry employment shares (where % employment in social services is the omitted category). As expected, a higher share of agricultural employment is positively associated with the share of low-wage earners in the area. Given the nature of agricultural jobs, this pattern is expected. Whereas, a higher share of producer services employment is linked with a lower share of workers who earn low-wage per hour. As expected, a higher labor force participation rate is inversely related with a CCS's share of workers with low earnings.

Consistent with the human capital theory, all the education variables are significantly different from zero with the expected negative sign. Communities with higher levels of human capital are more likely to have workers with higher propensity to commute and the labor market friction is much smaller in terms of matching, thus they exhibit low share of workers who are low-wage earners. This is particularly the case as the returns to skill and experience increases with education. This is consistent with the finding that education affects the dynamics of individual earnings, as younger and more educated workers are more likely to move from low- to high-paid jobs (Sloane and Theodossiuou 1996). Nonetheless, policy-makers often err by only focusing on the supply side of the job market and overlooking the fact that a greater availability of jobs does not necessarily guarantee a good match between the unemployed and employers (Glaser, 1997). As a result, one of the most effective ways of addressing regional unemployment disequilibrium can be through skill development for the non-employed. This result is consistent with the findings by Statistics Canada (2006) which documents that low wage work was far more prevalent for

[21] This result also applies for all the subsequent regressions. The partial R-squares for the two instruments remain the same even after many covariates are added.

those with lower levels of education. Among those with university degrees, it was never higher than 10%. On the other hand, the concentration of both aboriginal and recent immigrant population has a positive association with the share of low-wage earners. However, neither coefficient is statistically significant at conventional levels.

The dynamics of wages and wage growth may vary across rural and urban labour markets for reasons associated with the location of firms and agglomeration economies (Vera-Toscano et al., 2003). To address this issue, the regression in column 2 was re-run by splitting the entire sample into rural and urban subsamples. Regression results for the rural subsample are presented in Column 3 while column 4 shows the results for the urban subsample.

Comparison of results from the rural and urban regressions reveals the following trend. First, after controlling for demographic, economic and geographic variables, in rural CCSs the effect of job access is negative but insignificant. However, the effect of CCS's own job availability is significant and higher in rural Canada than urban Canada. This result is consistent with the findings of Renkow (2003) where the study documents a significant rural-urban difference in commuting flows and that a greater fraction of new jobs in urban areas are taken by in-commuters than the case in rural regions of the United States. Moreover, Partridge and Rickman (2005, 2008a) note that changing employment conditions in rural (non-metropolitan) counties in the United States trigger fewer commuting and migration responses with most job-growth advantages going to local residents. [22]With regards to urban Canada, the finding indicates that in communities where there is high labor supply elasticity[23], job access *per se* may not exclusively advantage the local residents. In-commuters with higher level of education or experience may be able to take the advantage unless the local workers have competitive skills or education (Partridge and Rickman, 2008; Levy and Munrane, 1992).[24]

The effect of human capital is even more pronounced in the urban subsample. The coefficients of education variables are much higher in urban CCSs. For example, a 1 percent increase in university graduates reduces the share of low wage earners by 0.61 percentage points compared to 0.49 in rural Canada. This indicates the greater significance of the variation in the demand for

[22] Partridge and Rickman (2008) note that rural households depend more heavily on localized job growth because of more inelastic labour supply responses associated with the incomplete migration and commuting responses. They underline this as an evidence for the presence of *spatial match* in rural areas.
[23] Labour supply elasticity refers to changes in labour supply in response to changes in number of jobs or changes in labour market conditions.
[24] In this regard Vera-Tuscano et al., 2003 note that the positive effects of education on moving out of low pay for workers in rural areas is less than for their urban counterparts. Thus, education is likely to a less effective means of increasing pay in rural areas relative to urban ones, suggesting that policies such as a minimum wage will be more effective than job training at increasing the economic wellbeing of poor working families.

human capital skills across the urban CCSs in the sample. Hence, focusing on skill development and human capital investment in urban areas for low-wage earners or the unemployed can improve the job matching process.

To address the extra labor market friction peculiar to some demographic groups in the labor force, the percentage share of aboriginal Canadians and percentage of recent immigrants are also included in the rural and urban regressions. The share of aboriginals in the community is mainly included to address labor market attachment issues associated with institutional and other ethnicity related barriers peculiar to the aboriginal population. Similarly, the share of recent international immigrants is also included to control for immigration and language factors that may create a barrier to recent immigrant workers without sufficient or adequate integration with the Canadian mainstream culture. The rationale here is the job-information decline with distance is expected to be higher for these particular demographic groups compared with their mainstream Canadian workers.

The results in Columns 3 and 4 show that after controlling for local economic characteristics (industry shares, Job –accessibility etc.), only urban communities with higher shares of recent international immigrants exhibit higher shares of low-wage earners. This signals that there are other factors at play than language issues (Ham and Simpson, 1999). It could also be directly attributed to the lag in the process of integrating to the mainstream Canadian culture. On the other hand, labor market evidence indicates that experiences and skills of recent immigrants are often discounted in the Canadian labor markets. To further explore this issue, in a regression not reported, I include the share of international immigrants who has been residing in Canada for over 10 years. However, the coefficient of this variable is not statistically significant. This indicates that international immigrants who have had adequate time for integrating to mainstream Canadian culture would benefit from job access as they will be responsive by commuting or residential choice.[25] This result is consistent with findings of Warwick (1996) that notes that recent immigrants tend to have lower wages compared to their non-immigrants counterparts, although the number of hours worked is similar. However, Warwick (1996) also further notes that recent immigrant wage growth over time tends to be higher. Hence, Berman et al., (2003) assert that

[25] This is consistent with the result of a study in the United States where the disadvantage of recent immigrants tends to decline as immigrants are assimilated (Borjas, 1994).

supporting language classes for immigrants may not only speed their economic assimilation but may also provide a social benefit.[26]

The best example of–the immigrant *problem*, is the existence of higher shares of recent immigrants in gate-way cities such as Toronto and Vancouver, and having higher share of them working in minimum wage earning jobs despite higher job access. Thus for these particular demographic groups, higher job-access *per se* may not be a solution in reducing their exposure low- wage. Furthermore, Christophides and Swindinsky (2004) found that immigrants are not disadvantaged in the Canadian labor market although some studies have found that recent immigrants experience negative entry effect (e.g. Grenier and Gunderson, 2006) and face economic discrimination (Pendakur and Pendakur, 2007).

Finally, as a sensitivity analysis, regressions in columns 2 to 4 are re-estimated by changing the dependent variable from share of workers who earn less than $10 per hour to the average CCS's wage rate. The rationale for this is twofold. First, the wage gradient could be flat, particularly when one focuses on minimum wages (Ihlanfeldt and Sjoquist, 1990). Second, using CCS average wage might reflect the effect of other indirect factors such the profitability of different CCSs to firms (Houston, 2005). The results for this regression are depicted in columns 5 to 7. Column 5 depicts the regression for the entire sample whereas columns 6 and 7 present the rural and urban regressions respectively.

The result in column 5 (full sample regression) shows that the generic job access has a positive and significant association with CCS average wage but the effect of local jobs (CCS own) is not statistically significant after one controls for local demographic and economic variables. It shows also that communities with higher shares of agriculture and related activities tend to have negative effect on average wage rate in the area as agricultural employment tends to be more low-skilled and seasonal in nature. On the other hand manufacturing, personal and distribution and construction have a positive correlation.

With regards to the labor force related variables, the labor force participation rate has a positive association with average wage level but not statistically significant at conventional levels. This is due to the fact that higher labor force participation would not necessarily guarantee higher average wage. Nonetheless, higher share of prime-age (% of population 24 to 60 years) has a positive and significant association with average wages. Workers in this prime age tend to be

[26] Beshiri and Jiaosheng (2009) note that recent immigrants to rural Canada may be more overwhelmed due to a smaller community tax base to provide resources, a smaller population to provide assistance and perhaps a population that has less experience with cross-cultural community development.

more experienced and higher job tenure. This result is also consistent with the negative relationship that this variable exhibits with share of workers who earn minimum wage in a region.

Consistent with the previous results, human capital variables exhibit direct relationship with CCS average wage rate. However, only share of workers with above high school education have statistically significant relevance. Nonetheless in case of share of minimum wage earners, in reference to the omitted group (workers with less than grade 9 level) all education variables are negative and significant. With respect to average wages, the effect of education in terms of its magnitude is higher as the years of schooling increases. For example, a 1percentage point increase in the share of university graduates will increase average wage by 0.28 cents compared 0.12 cents increase in a CCS average wage for a 1 percentage point increase in the number of workers with some university degree. In a regression not reported, agglomeration economy measured as the population base within 100km was included and it exhibits a positive association with the average CCS wage. Whereas, higher population base within 100 and 200KM adversely affects average wage because this measure (i.e. higher population base more than 100km away) indicates remoteness and thus the only available jobs found in non-agglomerated economies, which tend to be lower skilled jobs.

Importantly, in the entire sample regression of model 5, higher shares of both populations who are aboriginal Canadians and recent immigrants exert *extra penalty* to CCS's average wage level. However, it is the share of recent immigrants that is statistically significant at conventional levels. This result particularly underlines that even after controlling for skills and job access these to particular groups do have some extra friction in the matching process.

To assess the spatial variation in the wage generation process in rural and urban Canada, regression in model 5 (the full-sample) is re-run for the rural and urban sub-samples depicted in columns 6 and 7 respectively. The results from the rural regression shows that, both job access and local jobs are important and are associated with higher average wages in rural CCSs. Particularly interesting here is that unlike in the case of low wage regression, average wages in rural communities respond to greater job-access in neighboring CCSs. Hence rural workers with certain skills and education can benefit by out-commuting given greater access to regional labor markets via high-ways and better public transit. In this regard Partridge et al. (2010) note that, policies aimed at enhancing rural commuting opportunities, such as regional infrastructure and regional economic development planning, may contribute to rural community growth and vitality. Although local job availability are important, Partridge et al. (2010) further emphasize that leveraging urban growth through enhanced access, rather than endogenously trying to create local

rural employment opportunities, especially in the face of the lack of agglomeration economies should be central in Canadian rural development. This is also consistent with findings in many empirical studies in the U.S. where rural communities tend to have low density, which in turn increases information costs, further impeding skills matching in the labour market (Brown and Stommes 2004; Davis, Connolly, and Weber 2003).

Similar to the previous results, the share of agriculture employment has a negative effect on rural average wages. Similarly, the human capital variables have consistent and positive effect on wages, however the magnitude of their effect is relatively small compared to the full sample regression. For example, a 1 percent increase in university degree holders in rural community will increase average wage level by 0.11 unit compared to 0.12 in the full sample.

Surprisingly, higher shares of the vulnerable demographic groups- i.e., aboriginal Canadians and recent immigrants do not add an extra penalty on average wages in rural CCSs. This could be due lower in-commuting rates and regional competition for rural jobs (Partridge and Rickman, 2008b). The informal nature of the job matching process in rural communities gives local residents greater advantage. Hence, recent immigrants and aboriginal Canadians might fare better in such type of local markets with better access to local and regional jobs. Besides, Gibbs (2002) notes that rural areas have thinner labour markets with higher unemployment rate where new jobs are filled quickly without too much emphasis on job- matching.

Column 7, presents the average wage regression result for the urban subsample. It shows that in urban CCSs, once human capital and other covariates are accounted for, regional generic job-access is associated with higher CCS average wages. However, CCS's local job variable is not statistically significant. This could be due to the fact that in urban areas employers might pay wages sufficient enough and advertise vacancies widely to attract better educated and experienced workers (Houston, 2005).

Interestingly, all the human capital variables are significant with higher magnitude compared to the other subsamples. For example, a 1 percentage increase in the share of worker who are high-school graduates would increase average wage by 0.11 units compared to 0.02 units in the rural sub-sample. The coefficient is even higher for university graduates.[27] This underlines the greater role of human capital in wage determination in urban Canada. Urban areas demand, attract, and retain higher-quality workers than do employers in non-urban areas (Yankow, 2006). For e.g.,

[27] This result is consistent with Beckstead et al. (2010) which notes that small differences in average years of schooling across urban and rural classes may translate into significant earnings differences.

Beckstead et al. (2010) find that up to one-half of urban–rural earnings differences in Canada are related to human capital composition. Vero-Toscano et al. (2004) also document evidence that returns to experience in rural labor markets are less than urban ones consistent with poorer rural job matching. Thus, in order for rural communities to participate in the rapidly growing sectors based on knowledge workers, an appropriately educated labor force is required (Olfert and Partridge, 2010)

To assess if density/agglomeration is 'stealing' from the job accessibility measure in terms of affecting its regression coefficient, population density was dropped from the model in sensitivity analysis. Yet, the size of the job-accessibility regression coefficient is mostly unaffected despite the correlation of the job-accessibility measure with population density being about 0.65. For example, in rural Canada, where job-access is crucial for low-wage workers, dropping population density from the regression changes the job-availability coefficient from -0.00035 (p-value=0.001) to -0.00040 (p-value=0.001), whereas the coefficient of generic job access changes from 0.0005 to 0.0009, but remains insignificant.

On the other hand, in a regression not reported, as potential sources of regional access for job, the population base within 100kms and population within 100 and 200kms were added.[28] The result shows that higher population base within 100kms is associated with higher average wage, and greater population base within 100 and 200km is inversely related to average wage in urban CCSs. This is consistent with many empirical findings that have found that urban regions tend to enjoy higher productivity and increasing returns to scale as a result of high density of economic activities (e.g. Partridge and Rickman 2008b; Carlino, 1979; Ciccone, 1996; Lewis and Mark, 2002).[29] In this regard, Partridge and Rickman (2008a) also note that although distance penalty for manufacturing firms has declined, increasing importance of services may contribute to greater distance penalties when farther from an agglomeration economy.

Particularly interesting here is that after controlling for a host of variables, the share of aboriginal Canadians in urban Canada is not associated with a lower CCS average wage. It should be noted here that sorting could cause the result in that aboriginals may move to high-wage places, producing a spurious link between the Aboriginal share and the low-wage share. Future work could examine this by instrumenting for the aboriginal share using distance weighted measures of

[28] Population within 100kms and population within 100 and 200kms have correlation coefficients of 0.40 and 0.10 with job access respectively.

[29] Rural workers are less likely to enjoy wage gains as a result of positive spillover effect due to their lower skill and education and lack (Gibbs, 2002)

the proximity of aboriginal populations to the city. However, the share of recent immigrants is still negative and significant. This suggests that CCSs with above average shares of recent immigrants face an extra penalty in average wage levels. This may suggest the need for a special urban oriented policy intervention to reduce labor-market barriers for recent international immigrants.

3.3.1 Interaction Results

To empirically test whether the *spatial mismatch* parameter for aboriginals and recent immigrant population is increasing with distance, the linear distance from the centroid of the CCS to the centroid of the nearest nearest Census Agglomerations (CAs) or Census Metropolitan Areas (CMAs)[30] is interacted with share these demographic groups. Hence, if spatial mismatch exists, there should be a negative relationship between distance to the core and CCS`s average wage rate or positive relationship with CCS share of low-wage earners. The result of this specification is presented in table 3.3. Only the coefficients of the interaction variables are included and there was no change to other coefficients and significance of the model.

Column 1 in Table 3.3 is re-estimation of Model 2 in table 3.2 by including the interaction variables. It shows that once the job-access and other demographic and economic variables are included, in the full sample higher distance from the urban core (CA or CMA) does not have statistically significant adverse effect on low-wage on communities with higher shares of both recent immigrants and aboriginal Canadians. This is also true when considering their joint significance (see F-test at the bottom of table 3.3).Similar to the results in Table 3.2, the interaction variables are also not significant in rural Canada (Model 3a.).

Re-enforcing the previous urban regression result of low-wage regression, the coefficients of both immigrants and aboriginals are significant with positive and negative signs respectively. However, the interaction variables are not statistically significant, but both are jointly significant. This result illustrates that the spatial mismatch in the labor market seems to be peculiar to aboriginals and recent immigrants in urban Canada. The result in column 4 (Model 7a.), further underlines this urban result. The distance interaction were included in the average wage equation in urban Canada shows increasing distance from the urban core penalizes urban CCSs with higher share of aboriginal Canadians. However, higher share of aboriginals in an urban CCS do not exert

[30]CAs and CMAs are defined as consisting of one or more adjacent municipalities surrounding a major urban core. The population required for an urban core to form a CMA is at least 100,000 and at least 10,000 for a CA. To be included in a CA or CMA, adjacent municipalities must be highly integrated with the central urban area, as measured by commuting flows (Heisz and McLeod, 2004).

a negative effect on CCS average wage on its own. On the contrary, immigrant interaction with distance is not as associated with lower CCS average wage. But higher share of recent immigrants is associated with lower average wage. This could be attributed to lower congestion and perhaps these recent immigrants probably move to locations further away from the urban core after they find a job.[31]

3.4 Conclusions

This study assesses the regional variation in wage and generic job proximity and local availability for nearly 1921 rural and urban Canadian communities using 1996, 1991 and 1981 Census data. In doing so, first a theoretical model is presented that captures the interaction between generic job creation, accessibility distances and wage determination with spatial mismatch as a backdrop. In particular, this study explores whether better employment access (geographic proximity) will improve labor market outcomes for low-wage earning rural and urban Canadians. Special attention is given to communities with greater concentration of recent immigrants and Aboriginal Canadians to account for institutional and other labor market barriers that these vulnerable demographic groups encounter.

By regressing a very conservative instrumental variable regression model, the study documents that higher job access is inversely related to share of workers who earn low- wage in a community. However, the role of generic job accessibility tends to have stronger effect in rural Canada. Low skilled workers in rural communities seem to be more sensitive to the local creation of jobs, where spatial frictions imply a more inelastic long-term labour supply curve, suggesting that place-based policies would have greater benefits (Partridge and Rickman, 2008). On the other hand, human capital tends to play a dominant role in urban Canada.

In regards to vulnerable demographic groups in the labor market, after controlling for job availability and proximity the study finds that only recent immigrants in urban areas still lag behind the main stream Canadian workers. This suggests the existence of some structural barriers in terms of access to better paying jobs. However, given adequate job access, higher concentration of aboriginal Canadians in urban areas does not have a statistically significant adverse effect on community wage level.

To this end, the results indicate that job-access and wage generation process interact differently

[31] As a sensitivity analysis (not reported), job access was measured differently as the number of jobs divided by labor market population, but the result is more or less consistent with the job access measure used in the paper. However, estimated coefficient of job-accessibility is smaller.

across rural and urban Canada and for different demographic groups.

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Table 3.1: Un-weighted Descriptive Statistics [a,b]

Variables	Full Sample		Urban		Rural	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Dependent Variables						
% Low wage earners (<$10)'96	33.64	11.50	25.59	6.28	36.35	11.60
Average wage per hour'96	13.85	3.53	16.68	2.36	12.91	3.35
Economic Variables						
% Poverty Rate/LICO	13.06	5.84	11.29	5.32	13.65	5.89
Surrounding job-access'91 [c]	500	1,341	1,205	2,482	263	335
Surrounding job-access'81[c]	408	1,116	975	2,075	218	279
Number of jobs (CCS-own)'91	7,170	40,833	23,934	79,075	1,539	2,049
Number of jobs (CCS-own)'81	5,880	35,676	19,356	69,403	1,353	1,842
% unemployment population ratio for 15+'91	12.23	9.10	10.03	4.56	12.98	10.07
% labor force participation'91	64.98	7.83	68.70	6.25	63.73	7.91
% agriculture'91	12.90	15.05	4.03	5.68	15.89	16.02
% other Primary'91 sectors	3.82	6.46	2.13	4.41	4.39	6.92
% manufacturing'91	14.48	10.08	14.87	7.53	14.34	10.80
% construction'91	7.31	3.83	7.74	2.89	7.17	4.09
% distribution services'91	21.95	5.85	24.97	4.48	20.93	5.91
% personal services'91	11.19	4.75	11.84	2.97	10.97	5.20
% producer services'91	7.09	3.77	9.81	3.69	6.18	3.34
Population density (per km^2)'91	81.74	354.11	280.23	667.61	15.07	18.92
Population within 100km '91	1,017,416	1,395,840	1,587,752	1,754,118	825;849	1,193,786
Population within 100km and 200kms	1,204,504	1,427,016	1,333,326	1,416,803	1,161,235	1,428,314
Demographic Variables						
% population 15 to 24 years old'91	13.35	2.58	13.72	2.08	13.23	2.72
% population age 24 to 60 years old'91	46.93	4.19	49.85	3.01	45.95	4.07
% persons 15+ university graduates'91	5.79	3.72	8.67	4.76	4.82	2.67
% persons 15+ with some university education.'91	6.46	3.07	8.09	3.09	5.91	2.86
% persons 15+ with non university education'91	24.71	5.40	28.17	3.80	23.55	5.36
% persons 15+ high school grads'91	14.59	4.05	16.09	3.23	14.09	4.17
% persons 15+ non high school'91	27.67	6.44	24.92	5.49	28.59	6.47
% persons 15+ with less than grade 9'91	20.79	9.17	14.06	6.30	23.05	8.88
% aboriginals'91	4.26	9.44	3.48	5.53	4.51	10.42
% recent immigrants (5 years or less)'91	0.31	0.76	0.67	1.33	0.19	0.35
% French and English (mother	0.21	0.53	0.30	0.54	0.18	0.53

tongue) '91						
% French only'91	38.80	44.96	37.47	43.80	39.25	45.34
% English only'91	60.70	44.92	61.86	43.68	60.32	45.33
% neither English nor French'91	0.21	0.53	0.37	0.88	0.25	1.46
Number of Observations	1,921		483		1,438	

a. The data for the three census years included in the study (1981, 1986, 1991, and 1996) yield a total of 1921 CCCs with complete data in these three censes. Due to concerns about outliers and Statistics Canada data suppression, the territories and CCSs with a population of less than 250 are excluded. Additional CCSs were omitted due to inconsistent or incomplete data.

b. Total number of jobs is calculated from the place-of –work data (not weighted).

c. The place-of –work data is a special tabulation for the experienced labour forces 15 years and over are available at the 1996 constant boundary.

Table 3.2: Regression Results

Variables	**Model 1[a]**	**Model 2[a]**	**Model 3[a]**	**Model 4[a]**	**Model 5[b]**	**Model 6[b]**	**Model 7[b]**
Surrounding job-access'91 (proximity)	-1.02E-03	-1.81E-04	9.21E-04	-1.24E-04	1.46E-04	6.77E-04	8.26E-05
	(-1.91)	(-1.49)	(0.85)	(-1.40)	(2.42)	(2.18)	(2.65)
Number of jobs (CCS-own)'91 (Availability)	-1.58E-05	-4.00E-07	-3.48E-04	5.40E-06	1.00E-07	1.67E-04	-1.00E-07
	(-2.22)	(-0.16)	(-3.36)	(0.79)	(0.10)	(5.07)	(-0.14)
% agriculture'91		0.29	0.26	0.28	-0.09	-0.09	-0.01
		(5.62)	(3.88)	(4.19)	(-6.94)	(-5.57)	(-0.30)
% other Primary sectors'91		-0.08	-0.09	-0.09	0.10	0.09	0.18
		(-1.43)	(-1.40)	(-1.44)	(5.90)	(4.32)	(9.51)
% manufacturing'91		0.02	0.06	-0.12	0.05	0.03	0.10
		(0.55)	(1.16)	(-2.50)	(4.14)	(2.28)	(6.47)
% Construction'91		0.22	0.19	0.17	-0.02	-0.02	-3.35E-03
		(2.66)	(2.04)	(1.46)	(-0.86)	(-0.73)	(-0.12)
% distribution services'91		0.08	0.14	-0.05	0.05	0.03	0.05
		(1.21)	(1.66)	(-1.02)	(2.52)	(1.21)	(2.96)
% producer services'91		-0.24	-0.22	-0.18	0.04	0.02	0.11
		(-2.66)	(-2.09)	(-1.79)	(1.37)	(0.48)	(3.70)
% personal services '91		0.19	0.17	0.17	-0.03	-0.02	-0.01
		(2.59)	(2.03)	(1.42)	(-1.21)	(-0.81)	(-0.50)
% unemployment population ratio 15+'91		-0.10	-0.11	-7.48E-04	0.01	0.02	0.01
		(-2.11)	(-1.91)	(-0.01)	(0.46)	(1.15)	(0.37)
% labor force participation'91		-0.13	-0.13	-0.06	-0.01	-0.01	-0.06
		(-2.10)	(-1.88)	(-0.66)	(-0.54)	(-0.36)	(-2.83)
% of population 15 to 24 years'91		-0.27	-0.20	-0.11	0.13	0.11	0.12
		(-1.61)	(-0.97)	(-0.62)	(2.90)	(1.99)	(2.87)
% of population 24 to 60 years'91		-0.31	-0.23	-0.53	0.10	0.06	0.22
		(-3.10)	(-1.94)	(-3.53)	(3.64)	(1.89)	(4.97)
% university graduates'91		-0.44	-0.39	-0.49	0.23	0.15	0.31
		(-3.67)	(-2.52)	(-3.19)	(6.28)	(3.09)	(8.31)

% with some university education'91		-0.39	-0.28	-0.48	0.11	0.07	0.18
		(-2.57)	(-1.50)	(-2.52)	(2.60)	(1.48)	(4.00)
% with non university education'91		-0.45	-0.45	-0.24	0.09	0.08	0.09
		(-6.36)	(-6.12)	(-2.00)	(4.48)	(3.65)	(2.84)
% high school grads'91		-0.22	-0.23	-0.23	0.03	0.02	0.09
		(-2.39)	(-2.19)	(-1.77)	(1.48)	(0.61)	(2.59)
% non high school'91		-0.32	-0.32	-0.38	-0.01	-0.02	0.06
		(-4.19)	(-3.85)	(-2.70)	(-0.63)	(-0.93)	(1.73)
% mother tongue French and English'91		0.21	0.38	-0.31	0.20	0.22	-0.01
		(0.64)	(0.95)	(-0.73)	(1.84)	(1.72)	(-0.13)
% French only'91		-0.04	-0.04	-0.04	1.31E-03	-1.03E-03	3.21E-03
		(-2.91)	(-2.35)	(-2.31)	(0.32)	(-0.23)	(0.64)
% neither English nor French'91		-0.87	-0.82	-0.97	0.21	0.18	0.34
		(-4.39)	(-4.25)	(-2.51)	(4.30)	(4.23)	(2.71)
% aboriginals'91		0.05	0.06	-0.12	-0.01	-0.01	0.05
		(1.49)	(1.45)	(-2.21)	(-0.70)	(-1.25)	(2.73)
% recent immigrants (5 years or less) '91		0.46	-0.13	1.05	-0.24	-0.10	-0.44
		(0.90)	(-0.10)	(4.23)	(-2.24)	(-0.39)	(-5.45)
Population Density'91		9.82E-04	-0.02	6.37E-04	-5.21E-04	0.01	-5.41E-04
		(1.30)	(-1.61)	(1.45)	(-2.62)	(2.73)	(-3.79)
Provincial Fixed Effects	Y	Y	Y	Y	Y	Y	Y
r2	0.21	0.43	0.31	0.66	0.58	0.45	0.76
Under-identification test of all instruments(Kleibergen-Paap rk LM statistic)	3.43	4.30	31.81	3.90	4.22	31.81	6.49
Weak Instrument. Wald F	485.5 †	1180.62 †	270.36 †	1384.90†	1180.62 †	270.36 †	1384.90 †
N	1921	1921	1438	483	1921	1438	483

a. The dependent variable in columns 1 to 4 is the 1996 share of workers earning less than $10 per hour. The values in parentheses are robust t-statistics. The robust t-statistics are adjusted for regional clustering of the error terms in all regressions. See the text for details.

b. T he dependent variable in columns 5 to 7 is the 1996 average wage rate in a CCS. The values in parentheses are robust t-statistics. The robust t-statistics are adjusted for regional clustering of the error terms in all regressions. See the text for details.

c. †indicates exceeds Stock and Yogo (2005) critical values for bias reduction to no more than 5% of the OLS estimates and exceeds the critical value for 10% maximal IV size distortion.

d. See the text and Table 3.1 for listing of variables.

Table 3.3 Regression Results with Interaction Variables: Distance to nearest CA or CMA with Aboriginal and Immigrant Population Shares

Variables[c]	Model 2a[a†]	Model 3a[a†]	Model 4a[a†]	Model 7a[a†]
% aboriginals`91	0.05	0.07	-0.15	0.07
	(1.11)	(1.41)	(-2.46)	(3.47)
% recent immigrants (5 years or less)`91	-0.09	-1.25	1.26	-0.69
	(-0.14)	(-0.67)	(3.70)	(-5.23)
% aboriginals`91 x distance in kms to nearest/actual CA/CMA	-1.20E-06	-1.23E-04	4.09E-04	-3.01E-04
	(-0.01)	(-0.65)	(1.33)	(-3.11)
% recent immigrants`91 x distance in kms to nearest/actual CA/CMA	0.02	0.02	-3.47E-03	0.01
	(1.69)	(1.16)	(-0.45)	(2.04)
F-test $\beta_{\%\text{ aboriginal * distance to urban core}} = \beta_{\%\text{ aboriginal}}$	1.71	2.02	6.06	14.11
	(P-value=0.43)	(P-value=1.45)	(P-value = 0.04)	(P-value = 0.0009)
F-test $\beta_{\%\text{ immigrants * distance to urban core}} = \beta_{\%\text{ immigrants}}$	3.63	1.45	18.34	39.77
	(P-value=0.16)	(P-value =0.48)	(P-value=0.0001)	(P-value = 0.0000)

a. The dependent variable in columns 1 to 3 is the 1996 share of workers earning less than $10 per hour. The values in parentheses are robust t-statistics. The robust t-statistics are adjusted for regional clustering of the error terms in all regressions. See the text for details.

b. †indicates exceeds Stock and Yogo (2005) critical values for bias reduction to no more than 5% of the OLS estimates and exceeds the critical value for 10% maximal IV size distortion.

c. See the text and Table 3.1 for listing of variables.